Practical Computing

80p

March 1982

Volume 5 Issue 3

Adventure — the greatest game
Giant mazes

Reviews:
16-bit Sirius
Sales Ledger

Satellite tracking

Programmers' aptitude test

Plus 16 pages of your software

Cromemco System One

MicroCentre introduce Cromemco's new System One computer, available with an integral 5 megabyte Winchester hard disk, at a new low price.

The System One supports the full range of Cromemco interface cards, including high resolution colour graphics, and software packages. The choice of operating systems includes CDOS, CP/M and CROMIX—Cromemco's answer to Unix.

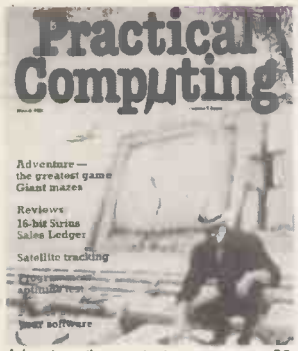
Call MicroCentre for Cromemco

2

MicroCentre Ltd
(Complete Micro Systems)

Britain's independent
Cromemco importer

30 Dundas Street
Edinburgh EH3 6JN
Tel: 031-556 7354



Adventure; the greatest game — page 89

Editor
Peter Laurie
Associate Editor
Duncan Scot
Deputy Editor
Toby Wolpe
Assistant Editor
Bill Bennett
Sub-editor
John Liebmann
Prestel Editor
Martin Hayman
Editorial Secretary
Julie Milligan
Consultants
Technical **Nick Hampshire**
Software
Chris Bidmead
Peter Wood
Editorial: 01-661 3500
Advertisement Manager
David Lake 01-661 3021
Assistant Advertisement Manager
Ken Walford 01-661 3139
Advertisement Executive
Philip Kirby 01-661 3127
Midlands office:
David Harvett 021-356 4838
Northern office:
Geoff Aikin 061-872 8861
Advertisement Secretary
Mandy Morley
Publishing Director
Chris Hipwell

Published by IPC Electrical Electronic Press Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500. Telex/grams 892084 BIPRESG.
Typesetting by Action Typesetters Ltd, London E17.
Printed by Eden Fisher Ltd, Southend-on-Sea.
Distributed by IPC Business Press (Sales and Distribution) Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.
Subscriptions: U.K. £10 per annum; Overseas £16 per annum; selling price in Eire subject to currency exchange fluctuations and VAT; airmail rates available on application to Subscription Manager, IPC Business Press (S & D) Ltd, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. Tel: 0444 59188.
© IPC Business Press Ltd 1982
ISSN 0141-5433

Would-be authors are welcome to send articles to the Editor but *PC* cannot undertake to return them. Payment is at £30 per published page.
Submissions should be typed or computer-printed. Handwritten material is liable to delay and error.
Every effort is made to check articles and listings but *PC* cannot guarantee that programs will run and can accept no responsibility for any errors.

CONTENTS

41 **Editorial** / The end of history

43 **Feedback** / The NEC PC-8001B; ICL's views on its place in the micro market; Pet data transfer

46 **Printout** / Torch twin-processor micro; multi-headed Hydra for Pet; two new correspondence-quality printers

53 **Printout Extra** / Bill Bennett visits a Curry's Micro-C store to look at the service agreements on offer

54 **Sirius** / We review the 16-bit Sirius computer, designed by Chuck Peddle, the man behind the 6502 microprocessor and the Commodore Pet

61 **Ricoh printers** / Chris Bidmead tests the RP-1600 daisywheel and ApTech's Flowriter, a U.K. product based on the Ricoh mechanism

69 **Gemini Video Board** / The new Intelligent Video Card from Gemini — you can use it in your Nascom — reviewed by Nick Laurie

71 **Kontron** / Mike Hughes examines the West German Kontron business micro with a built-in hard disc. Is it really worth the extra cost?

77 **Apple software** / An investigation of Shape Manager from Sinta, and Sensible Software's Aplus, which offers you a structured Basic

84 **Sales Ledger** / Peter Wood reviews a combined ledger, stock-control and invoicing package by Anagram

89 **Adventure** / Dennis Ellis gives you the history and prospects of this ever-popular game, along with a digest of the many versions for different machines. You can also try your hand at Graham Relf's Monster Maze

97 **Labyrinth** / A portable Adventure-style game by P J Goss

100 **Trojan Horse** / Fiction by Marise Morland

103 **Atom in exile** / Martin Hayman narrates the tale of an Acorn Atom's role on a geographical expedition to St Helena

104 **Satellite tracker** / Use this program to pinpoint artificial satellites

107 **Telesoftware** / Marketing skills and Prestel combine in a powerful bait for micro buyers

108 **Patsy** / Test your aptitude as a programmer with a program based on the infamous IBM examinations

116 **Art** / Brian Reffin Smith's stimulating pages, with more inside tips on graphics and design

119 **Open File** / A new 15-page section of your programs, incorporating Z-80 Zodiac, ZX-80/81 Line-up, 6502 Special, Pet Corner, Apple Pie and Tandy Forum

149 **Micromouse** / More news of the Micromouse contest from Nick Smith

151 **Book reviews**

153 **Puzzle**

155 **A price list from a Pet** / Solving the problems of a retail warehouse

159 **Unix** / Is this the operating system that will oust CP/M from the number-one slot?

165 **Peripherals buyers' guide**

179 **The War Machine** / D-day — a battle simulation game

Prestel page number 357

◀● 101 for inside cover

WATFORD ELECTRONICS

33/35, CARDIFF ROAD, WATFORD, HERTS, ENGLAND
Tel Watford (0923) 40588. Telex: 8956095

MAIL ORDER CALLERS WELCOME

ALL DEVICES FULL SPEC. AND FULLY GUARANTEED. TERMS OF BUSINESS: CASH/CHEQUE/P.O.S. (OR ACCESS) WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE AND EXPORT INQUIRIES WELCOME. (P&P ad 50p on all orders under £10.00).

VAT ALL PRICES ARE EXCLUSIVE OF VAT. PLEASE ADD 15% TO THE TOTAL COST INCLUDING P & P.

SHOP HOURS: 9.00am - 6.00pm MONDAY TO SATURDAY.
AMPLE FREE CAR PARKING SPACE AVAILABLE.

COMPUTER IC's

1702	299
1802CP	700
2101-2	110
2112-2	250
2114L-300n	87
2114L-200n	87
2118-3	250
2118-4	200
2147-3	425
2532-450n	450
2564	20
2708	175
2716-5V	210
2732-450n	400
2764	19
4027	240
4116-150n	95
4116-200n	75
4118-250	400
4164-200	620
4315-4K	795
4334-3 (CMOS2114)	325
4864-3 64K	785
5101	270
6116-3	580
6147-3	
6502-CPU	399
6503	600
6504-250	295
6505	600
6520 PIA	175
6522 VIA	350
6530 RRIOT	1350
6532 RIOT	670
6545 CRTC	1450
6551 ACIA	785
6592 PC	20
6800	300
6802	400
6803	12
6804	160
6805	670
6808	520
6809	999
6810	120
6820	175
6821	125
6840	420
6843	14
6845	975
6847	850
6850	150
6852	255
6875	500
8039	00
8080A	350
8085A	550
81LS95	90
81LS96	90
81LS97	90
8166	00
8123	125
8155	00
8202	25
8212	170
8214	425
8216	70
8224	200
8226	250
8228	250
8243	00
8251	320
8253	799
8255	395
8257	800
8T26A	99
8T27	150
8T28A	115
8T31	350
8T95N	99
8T97N	99
9364AP	550
AM26LS31C	125
AM26LS32A	125
AY-3-1015	350
AY-3-8910	620
AY-3-8912	600
AY-5-1013	300
AY-5-2376	600
FD1771	18
IM6402	380
MC1488	55
MC1489	55
MC14411	695
MC14412	795
MM5280D	695
RO-3-2513L	750
RO-3-2513U	600
SFF96364E	800
SFC71301	820
TMS2716-3V	875
TMS6011	365
ULN2003	100
ULN2004	150
Z80CPU 2.5	350
Z80ACPU4M	385
Z80 P10	290
Z80AP10	320
Z80 CTC	300
Z80A CTC	325
Z80DMA	999
Z80S10-1	15
Z80AS10	23
Z80 DART	726
Z80A DART	725
ZN419CE	190
ZN423E	138
ZN424E	130
ZN425E	345
ZN426E	300
ZN427E	600
ZN428E	478
ZN429E	210
ZN1034E	200
ZN1040E	675
74S132	138
74S138	210
74S188	210
74S189	158
74S194	360
74S201	350
74S241	540
74S262	850
74S287	325
74S288	210
74S470	325
74S471	620
74S472	1150
74S475	825
74S571	620
75150	125
75108	350
75182	115
75183	115
75154	150
75188	65
75189	65
75322	165
75450	95
75451/2	70
75454	225
75491/2	70

TTL7400 (TEXAS)

7400	11
7401	11
7402	11
7403	14
7404	14
7405	18
7406	28
7407	28
7408	16
7409	16
7410	14
7411	20
7412	20
7413	24
7414	32
7416	25
7417	25
7420	16
7421	20
7422	20
7423	22
7425	28
7426	30
7427	27
7428	28
7430	16
7432	26
7433	27
7437	27
7438	27
7440	17
7441	68
7442	38
7443	90
7444	90
7445	65
7446	55
7447	50
7448	50
7450	16
7451	16
7453	16
7454	16
7460	16
7470	35
7472	30
7473	30
7474	25
7475	40
7476	30
7480	48
7481	120
7482	70
7483	50
7484	80
7485	95
7486	26
7489	205
7490	28
7491	45
7492	30
7493	30
7494	34
7495	50
7496	45
7497	120
74100	85
74104	54
74105	55
74107	32
74109	35
74110	40
74111	55
74112	170
74116	88
74118	80
74119	90
74120	75
74121	30
74122	45
74123	50
74125	42
74126	40
74128	42
74132	48
74136	35
74141	70
74142	190
74143	250
74144	250
74145	70
74147	99
47148	75
47150	80
74151	45
74153	45
74154	75
74155	75
74156	75
74157	45
74159	99
74160	60
74161	60
74162	62
74163	64
74164	64
74165	62
74166	65
74167	185
74170	168
74172	290
74173	65
74174	72
74175	72
74176	55
74177	75
74178	95
74179	68
74180	65
74181	140
74182	75
74184	99
74185	99
74188	290
74190	70
74191	70
74192	70
74193	65
74194	75
74195	65
74196	65
74197	65
74198	99
74199	99
74221	80
74246	150
74247	150
74248	150
74249	150
74251	80
74259	195
74265	65
74273	195
74276	150
74278	160
74279	90
74283	90
74284	199
74285	199
74290	105
74293	125
74297	236
74298	100
74351	195
74365	55
74366	55
74367	55
74368	55
74390	99
74393	99
74490	120

74LS

LS00	12
LS01	13
LS02	14
LS03	14
LS283	45
LS290	57
LS293	46
LS04	15
LS06	15
LS08	15
LS09	15
LS10	15
LS11	15
LS12	15
LS13	30
LS14	48
LS15	15
LS20	15
LS21	15
LS22	15
LS26	18
LS27	15
LS28	20
LS30	18
LS32	15
LS33	16
LS37	16
LS38	16
LS40	16
LS42	35
LS47	40
LS48	80
LS49	60
LS51	15
LS54	15
LS55	30
LS63	150
LS73	25
LS74	25
LS75	28
LS76	20
LS78	24
LS83	50
LS85	70
LS86	38
LS90	35
LS91	80
LS92	36
LS93	36
LS95	45
LS96	120
LS107	43
LS109	30
LS112	30
LS113	40
LS114	35
LS122	44
LS123	55
LS124	105
LS125	30
LS126	30
LS132	45
LS133	35
LS136	28
LS138	35
LS139	38
LS145	75
LS147	199
LS148	99
LS151	39
LS153	39
LS155	39
LS156	39
LS157	35
LS158	36
LS160	41
LS161	41
LS162	41
LS163	41
LS164	48
LS165	145
LS166	85
LS170	175
LS173	72
LS174	72
LS175	58
LS181	130
LS183	275
LS190	58
LS191	58
LS192	58
LS193	65
LS194	40
LS195	40
LS196	58
LS197	55
LS200	345
LS202	345
LS221	60
LS240	96
LS241	96
LS242	85
LS243	85
LS244	80
LS245	90
LS247	40
LS248	65
LS249	68
LS251	40
LS253	40
LS257	48
LS258	40
LS259	85
LS261	195
LS266	25
LS273	90
LS275	290
LS279	88
LS280	250
LS295	215
LS298	130
LS299	420
LS300	157
LS302	175
LS320	270
LS323	270
LS423	200
LS323	270
LS324	200
LS325	320
LS326	330
LS327	315
LS347	150
LS348	190
LS352	185
LS353	185
LS365	37
LS366	37
LS367	37
LS368	90
LS373	75
LS374	75
LS375	48
LS377	90
LS378	69
LS379	65
LS384	395
LS385	378
LS390	62
LS393	60
LS395	199
LS399	220
LS445	140
LS471	620
LS490	245
LS541	135
LS640	225
LS641	225
LS645	210
LS668	175
LS669	150
LS670	175
LS673	550
LS674	750

CMOS

4000	14
4001	14
4002	14
4006	66
4007	18
4008	62
4009	35
4010	40
4011	15
4012	18
4013	34
4014	75
4015	66
4016	32
4017	48
4018	68
4019	42
4020	61
4021	70
4022	66
4023	20
4024	45
4025	19
4026	130
4027	38
4028	58
4029	77
4030	50
4031	170
4032	125
4033	165
4034	195
4035	95
4036	275
4037	115
4038	110
4039	290
4040	59
4041	78
4042	60
4043	70
4044	65
4045	170
4046	75
4047	75
4048	55
4049	30
4050	30
4051	78
4052	78
4053	78
4054	125
4055	125
4056	120
4057	1915
4059	480
4060	90
4061	1225
4062	995
4063	99
4066	36
4067	399
4068	22
4069	20
4070	26
4071	20
4072	20
4073	20
4075	20
4076	60
4077	26
4078	26
4081	26
4082	21
4085	65
4086	70
4089	140
4093	43
4094	168
4095	90
4096	90
4097	320
4098	88
4099	95
4160	95
4161	99
4162	99
4163	99
4174	99
4175	105
4194	105
4408	790
4409	790
4410	725
4411	695
4412	800
4415	480
4419	280
4422	770
4433	770
4435	850
4440	999
4450	350
4451	350
4490	350
4500	675
4501	28
4502	90
4503	50
4504	105
4506	65
4507	40
4508	265
4510	68
4511	68
4512	75
4513	199
4514	195
4515	198
4516	75
4517	415
4518	42
4519	29
4520	78
4521	200
4522	125
4526	95
4527	115
4528	80
4529	150
4530	90
4531	130
4532	110
4534	500
4536	295
4538	115
4539	115
4541	140
4543	135
4544	150
4549	395
4553	299
4554	190
4555	50
4556	55
4557	320
4558	120
4559	395
4560	180
4561	104
4562	495
4566	175
4568	250
4569	175
4572	36
4580	460
4581	250
4582	99
4583	99
4584	48
4585	99
4597	330
4598	290
4599	595
40097	88
40100	215
40101	130
40102	180
40103	175
40104	95
40105	115
40106	75
40107	60
40108	450
40109	100
40110	300
40114	240

ETI/ WATFORD'S MICRO EXPANSION SYSTEM

Designed by Watford Electronics, this extremely versatile and economical Expansion System as published in E.T.I., starting from Dec., 1981 issue, offers a low cost flexible expansion system for ZX81, UK101, SUPERBOARD, ACORN ATOM, PET, TANGERINE, etc.

The Motherboard (interfaces with the computer) has capacity to accept up to five daughter Cards and can be paralleled for even more Daughter Cards.

All PCBoards are of computer grade finish and are supplied in Kit form.

Just look at the Expansion possibilities.

MOTHERBOARD — Accepts up to five Daughter Cards. Full Kit: £36.50.

SOUND CARD — Utilising up to three AY-3-8910 sound chips. (one supplied with the kit). Full Kit: £24.95.

PIO CARD — Using two 6520 PIA chips, this Board offers Centronics parallel printer driver, digital to analogue converter & a host of other output facilities. Full Kit: £19.95.

PROM PROGRAMMER — This simple but extremely useful card can blow 2716 or single rail EPROMS.
(2732) Full Kit: £19.95.

PROM CARD — P.C.B. cards for housing four 2716 or two 2732 EPROMS.
(4 x 2716) Full Kit: £9.95.
(2 x 2732) Full Kit: £9.75.

RAM CARD — 8K RAM card. Accepts 16 x 2114 RAMs. Board is supplied fully populated. Full Kit: £28.50.

(N.B. PCBs may be bought separately).

WE MON WATFORD'S Ultimate Monitor IC.

A 4K Monitor Chip specially designed to produce the best from your: Superboard Series I & II, Enhanced Superboard & UK 101. As reviewed by Dr. A.A. Berk in Practical Electronics, June 1981.

Price only £14.95 + 50p P&P.

SEIKOSHA GP80A

Unihammer Printer, gives normal and double width characters as well as dot resolution graphics 8" Tractor feed. Parallel Interface standard. £195

SOFTY-2

As reviewed on PE September 1981. The complete microprocessor development system for Engineers & Beginners. New powerful instruction. Accepts any 24 pin 5V single rail EPROM. Supplied fully built, tested & enclosed in a black ABS case. Price incl. encapsulated plug in power supply. £169

SPECIAL OFFER

	1+	50+
2114L-450n	90p	85p
2114L-300n	87p	80p
2114L-200n	87p	80p
2708	175p	160p
2532	450p	375p
2716	210p	195p
2732	400p	375p
4027	240p	215p
4116	75p	68p
4334-3	325p	290p
6116-3	580p	550p
6522	350p	320p

Just phone your order through, we do the rest.

Buy it with Access

EPSON MX Series PRINTERS

Now available from stock at very competitive prices.

- **MX80T** 10" Tractor Feed, 9x9 matrix, 80 column Speed 80 CPS bi-directional Centronics Interface, Baud rate 110-9600 (RS232) £340
- **MX80FT** Has Friction & Tractor Feed plus all the MX80T's facilities. £375
- **MX80FT2** Has high resolution Graphics option plus all the MX80FT's facilities. £420
- **MX100** 132 Column plus all the facilities of MX80FT2. Value for money. £550

ACCESSORIES

- **TEX EPROM ERASER.** Erases up to 32 ICs in 15-30 min. £33
- Spare UV lamp bulbs £9
- 5V/5A PSU Ready built and tested £25
- Attractive Beige/Brown ABS CASE for Superboard/UK101 or Home Brew £26
- Extra 4K of RAM (8 off 2114L-300nS) £6.99
- Full ASC11 coded keyboard type '756' £39
- NUMERIC Keypad (Ready built) £9
- 4 x 4 matrix keypad (reed switch assembly) £4
- C12 Cassettes in Library Cases 40p
- 8½" Fan fold paper (500 sheets) (no VAT) £6
- 9½" Fan fold paper (500 sheets) (no VAT) £6
- Teleprinter Roll (no VAT) £3.50
- UHF Modulator 6MH2 280p
- UHF Modulator 8MH2 450p

CRYSTALS

32 768K Hz	100
100K Hz	270
200K Hz	295
455K Hz	370
1M Hz	295
1.28M Hz	392
1 6M Hz	395
1 8M Hz	395
1 008M	290
1 8432M	220
2 0M Hz	240
2 4576M	220
3 2768M	220
3 57954M	150
3 6864M	300
4 0M Hz	200
4 032MHz	290
4 80M Hz	200
4 194304M	200
4 433619M	120
5 0M Hz	200
5 185MHz	300
5 24288M	390
6 0M Hz	220
6 144MHz	240
6 5536MHz	200
7 0M Hz	200
7 168MHz	250
7 68M Hz	200
8 0M Hz	200
8 867237M	240
9 00M Hz	200
10 0M Hz	200
10 7M Hz	220
10 24MHz	200
12 0M Hz	290
14 31818M	320
16 0M Hz	275
18 0M Hz	240
18 432M	240
19 968MHz	325
24 0M Hz	200
26 69M	290
27 648M	330
27 145M	240
38 66667M	290
48 0M Hz	270
1000MHz	375
1160MHz	300

'D' CONNECTORS (Cannon Type)

	Plugs	Sockets	Solder Bucket Covers	DIL Switches
9 way	55p	125p	145p	4 way 70
15 way	135p	128p	150p	6 way 85
25 way	170p	250p	130p	8 way 90
37 way	290p	398p	185p	10 way 145

PCB Pins
25 way 200p 245p

PCB Pins (right angle)
25 way 210p 275p

HEADERS with Latches
10 way 90
20 way 145
50 way 235

JUMPER LEADS (Ribbon Cable Assembly)
Single Ended DIP Lead, 24" Cable
14 pin plug 145p 24 pin plug 240p
16 pin plug 165p 40 pin plug 380p
Double ended DIP Leads

Length	14 pin	16 pin	24 pin	40 pin
6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	210p	235p	345p	540p
36"	230p	250p	375p	595p

DIL PLUGS (Headers)

14 pin	44
16 pin	49
24 pin	88
40 pin	255

Ribbon Cable (Rainbow)

10 way	22p
20 way	40p
24 way	55p
40 way	70p

AMPHENOL PLUGS
24 way IEEE 575
36 way Cent. Parallel 550

DIL SOCKETS (TEXAS)

	Low profile	Wire wrap
8 pin	8p	25p
14 pin	10p	35p
16 pin	10p	42p
18 pin	16p	52p
20 pin	22p	60p
22 pin	25p	70p
24 pin	25p	70p
28 pin	28p	80p
36 pin	–	105p
40 pin	30p	99p

EDGE CONNECTORS double type

	1	156
2 x 10 way	–	135p
2 x 15 way	–	140p
2 x 18 way	180p	145p
2 x 22 way	199p	200p
2 x 25 way	225p	220p
2 x 30 way	245p	–
2 x 36 way	295p	–
2 x 40 way	315p	–
2 x 43 way	395p	–

VIC 20 MICROCOMPUTER
Connects directly to a colour TV set. 5K RAM expandable to 32K ex-stock £165

CASSETTE Deck for above including a free 6 program cassette £34

ZERO Insertion Force DIL Sockets
24 way 600p
28 way 850p
40 way 975p

VERO WIRING PEN incl. Wire 310p
Spare wire (spool) 75p
Combs 6p
9" MONITOR B&W Cased only £69

● Circle No. 102

PRINTERS

SEIKOSHA GP-80

The Smallest 80 Column Dot Matrix Printer.

Unique printer principle. 80 col lines. 30 cps. 12 cpl. Plain Paper. Tractor drive. Weight 2.5 kg. Footprint 12.6 sq. ins. Bit addressable graphics. Parallel interface standard. RS 232 Apple Pet TRS 80 options

£199

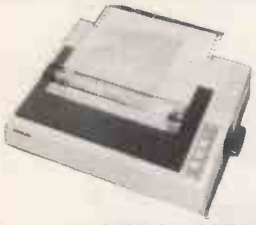
OKI MICROLINE 80 & 82A

Compact 80 Column Printer.

80-120 cps. Uni direction ML 82A bi-direction). Parallel interface. Serial interface option. (ML 82A standard). Pin and friction feed. Tractor option. Condensed and expanded characters. 80, 40, 66 and 132 cpl.

ML 80 £299
ML 82A £437

EPSON MX SERIES

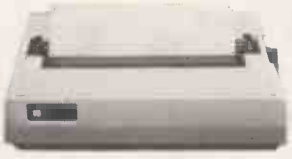


Low Noise, Low Price-High Performance Printer

Six models. 80 cps. Bi-directional. Parallel interface. RS232 Pet Apple TRS 80 Video Genie Sharp options. Letter quality. Lower case descenders. Condensed enlarged and bold characters. Models provide tractor roll and sheet feed - bit image graphics - up to 15 ins paper.

MX-80 £353
MX-80 F/T £399
MX-82 £447
MX-80 II £399
MX 80 F/T-II £447
MX-100 £569

OKI MICROLINE 83A



Medium Speed 15" Printer.

120 cps. Bi-direction. Pin and friction feed. Tractor option. 132 cpl at 10 cpi. 4 character sizes. Graphic characters. Parallel and serial interface. Fast serial interface option.

£827

ANADEX DP–9000 RANGE

Fast, Versatile Printers.

Seven models. Up to 15 inch paper width. Lower case descenders. 160-220 cps bi-directional printing. RS232 current loop & parallel interface. X on X off. Optional 2K buffer. Multiple print densities. Fast print of high-density bit image graphics.

DP-8000 £541
DP-9000L £747
DP-9001 £888
DP-9500 £935
DP-9000 £841
DP-9500L £841
DP-9501 £982

TEC STARWRITER

Best-Buy Daisy Wheel Printer.

Bi-direction. 25 cps. Low cost supplies. Standard Daisy Wheel. Carbon and fabric ribbons. Parallel or RS232 interface. Sheet feeder options.

Parallel Interface £1020
Serial Interface £1067

LEAR SIEGLER 310

Professional Dot Matrix Printer.

High throughput. 180 cps. Bi-direction. Fast head travel. Space skip over. Lower case descenders. Enlarged and bold fonts. Parallel RS232 and current loop interfaces. X on X off. Condensed character option. Sound reducing option.

£1386

FROM

RIVA

- **Authorised distributor**
- **Rapid delivery**
- **Dealer educational & quantity discounts**
- **Prices exclude VAT**

RIVA TERMINALS LTD.
New Head Office: Woking Business Park
Albert Drive, Woking, Surrey GU21 5JY
Tel: Woking (04862) 71001 Telex: 859502
Northern Office: Tel: Harrogate (0423) 503867

● **Circle No. 103**

·JUST OPENED·JUST OPENED·JUST OPENED·

·LONDON'S·
·HOME COMPUTER CENTRE·

·ACORN·

·BBC·

·PET·

·VIC·

·GAMES·HOME FINANCE·EDUCATION·
·ALL YOU NEED·ALL EXPLAINED·

There's a fantastic choice of home computers on the market today. Each one brilliant in its own right. But which one's right for you?

The jungle stops here! At Microstore, we'll understand your requirements and advise you on the best model.

From business or household management, to education or entertainment, there's something for you. Hundreds of items and accessories on display.

Business Computers
Apple II and III
Talk your requirements over with a practical business man.
Books, Disks, Printers, Programs, and all the back-up.
Also full after-sales-service.

·Come and see them before you buy·

MICROSTORE

·327·KING'S ROAD·LONDON·SW3·
·PHONE·01·352·9291·

MICROSTORE

● Circle No. 104

Duplex Communications

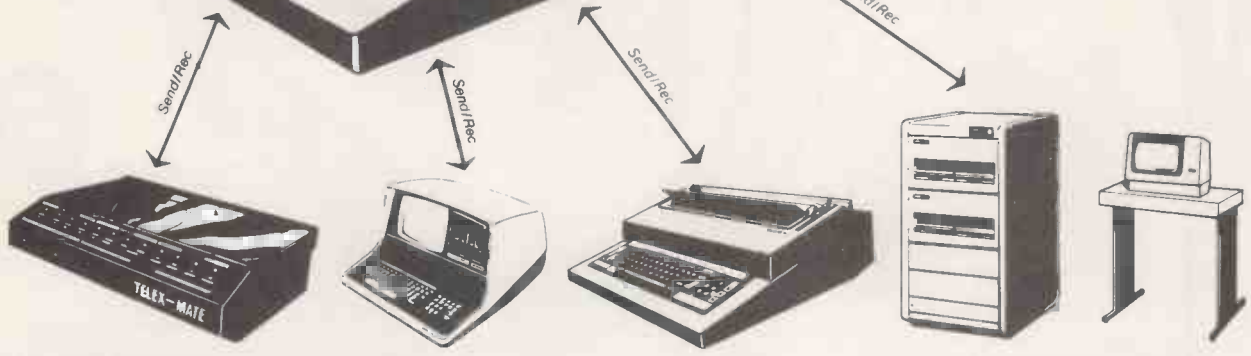
Northern Office: Dean House · Dean Hall Lane · Shaw Green · Euxton · Nr. Chorley · Lancs. Tel: 0257 453360
Midlands Office: 2 Leire Lane · Dunton Bassett · Nr. Lutterworth · Leicestershire. Tel: 0455 209131

● Computer Interfacing ● Equipment Design ● Systems Analysis ● Software Development ●

PRESENTS
The OCTET 121™ a multi-use communicating terminal and electronic typewriter

OLIVETTI ET121

- 4,000 char. memory
- Integral Text Editor
- Battery Back-Up
- KSR 'Control Key' Sequences
- Multiple Baud Rate Selection
- RS232C Connection



Telex-tape preparation | **Micro-computer** | **OCTET 121** | **Mini/Mainframe computer**

The OCTET 121 is capable of punching man-readable 'headers'. The full 4K of memory can be text-edited prior to punching. The OCTET 121 will also read in tapes where fast telex tape handling is required. Multiple OCTETs to one tape punch station is also available.

Use the OCTET 121 as a letter quality printer. A wide selection of Daisy Wheel typefaces are available. Terminal protocols to control the buffer are standard features.

OCTET 121 communication is achieved by simple cable connection or through an acoustic modem. Ideal for remote offices who would like to use the main office telex facilities. Prepare text at the remote office and transmit to main office to cut tape for forward transmission.

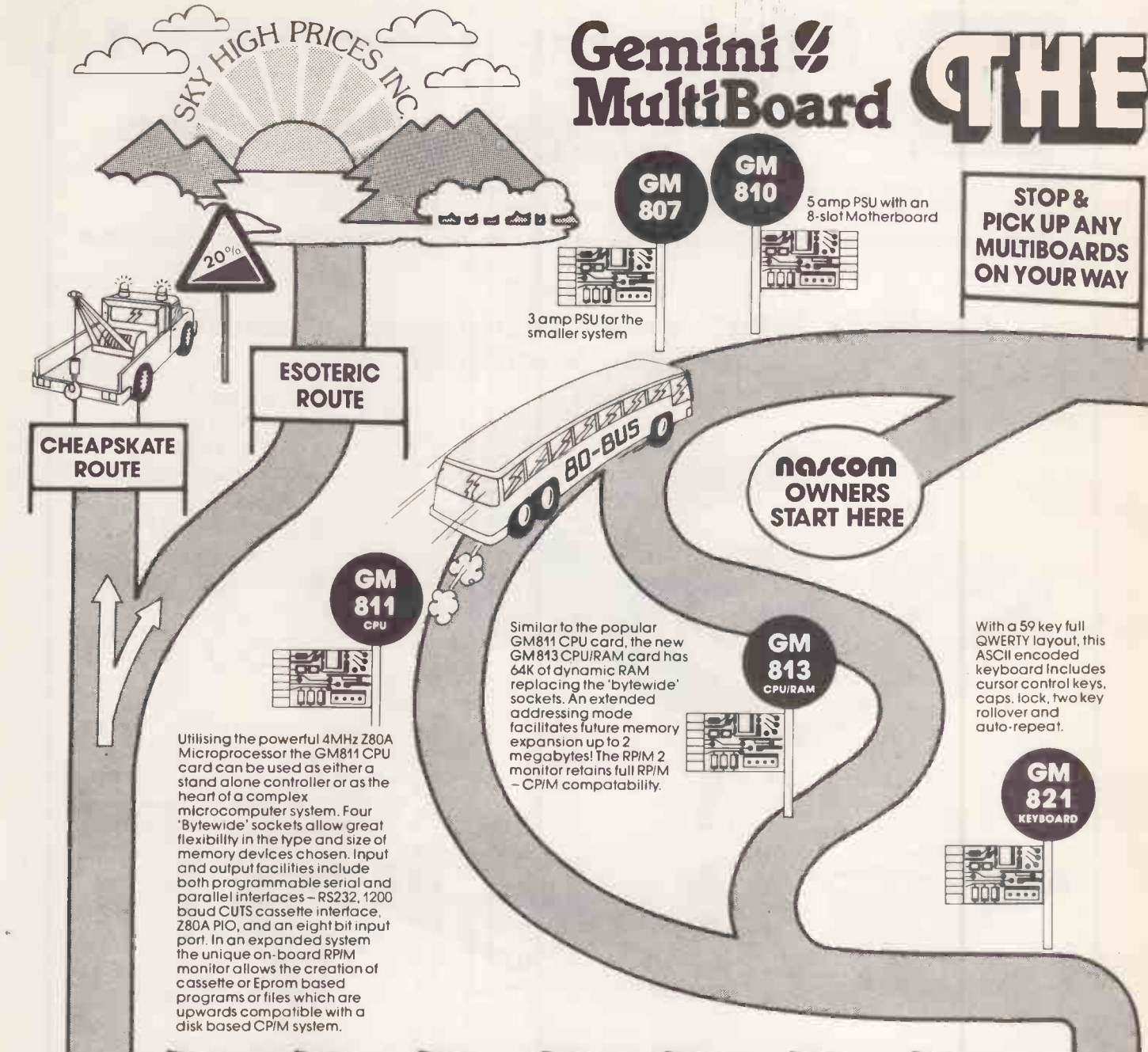
The OCTET 121 is a true KSR with all standard control sequences for operating system use. Ideal for the user who requires 'letter quality' print at all times. Use as a standard typewriter or telex prep. when not in KSR mode.

ICARUS
SUPERBRAIN DEALER

OCTET 121 has many uses and can be installed very easily in your office.
Call Duplex Communications Ltd. for more details. Telephone: Leire (0455) 209131 (Leicestershire)

™ OCTET 121 is a trade mark of Duplex Communications

● Circle No. 105



Gemini MultiBoard THE

Utilising the powerful 4MHz Z80A Microprocessor the GM811 CPU card can be used as either a stand alone controller or as the heart of a complex microcomputer system. Four 'Bytewide' sockets allow great flexibility in the type and size of memory devices chosen. Input and output facilities include both programmable serial and parallel interfaces – RS232, 1200 baud CUTS cassette interface, Z80A PIO, and an eight bit input port. In an expanded system the unique on-board RP/M monitor allows the creation of cassette or Eprom based programs or files which are upwards compatible with a disk based CP/M system.

Similar to the popular GM811 CPU card, the new GM813 CPU/RAM card has 64K of dynamic RAM replacing the 'bytewide' sockets. An extended addressing mode facilitates future memory expansion up to 2 megabytes! The RP/M 2 monitor retains full RP/M – CP/M compatability.

With a 59 key full QWERTY layout, this ASCII encoded keyboard includes cursor control keys, caps. lock, two key rollover and auto-repeat.

80 BUS STATION

ROUTE

The Gemini MultiBoard concept is the logical route to virtually any microcomputer system you care to name. Whether you require a business system, an educational system, a process control system or any other system, there is a combination of MultiBoards to fulfil that function.

This concept ensures maximum flexibility and minimal obsolescence. Maintenance and expansion is greatly enhanced by the modular board design. MultiBoard is based on the 80-BUS structure, which is finding increasing acceptance among other British manufacturers; thus broadening the product base.

FARES

Hardware (Built & tested)

GM802	64K RAM card	£140
GM803	EPROM/ROM card	£65
GM807	3A PSU	£40
GM808K*	EPROM programmer	£29.50
GM809	FDC card	£125
GM810K	5A PSU/8 slot motherboard	£69.50
GM811	Z80 CPU card	£125
GM812	Z80 IVC card	£140
(*Kit)		
GM813	Z80 CPU/64K RAM card	£225
EV814	IEEE 488 card	£140
GM815-1	Single drive disk unit with PSU (350K)	£325
GM815-2	Double drive disk unit with PSU (700K)	£550
QM816	Multi I/O board	£140
AM819	Speech board	£85
AM820	Light Pen	£35
GM821	ASC II keyboard	£57.50

Software

GM512	CP/M 2.2 for Multiboard	£90
GM517	Gem-Zap edit/asm tape	£45
GM518	Gem-Zap edit/asm disk	£45
GM519	Gem Pen editor/ text formatter tape	£45
GM520	Gem Pen editor/ text formatter EPROM	£45
GM521	Gem Pen editor/ text formatter disk	£45
GM524	Gem Dis disassembler/ debugger tape	£30
GM525	Gem Dis disassembler/ debugger disk	£30
GM526	Comal-80 tape	£100
GM527	Comal-80 disk	£100
GM528	APL disk	£200

LOGICAL ROUTE

GM 812 –IVC

The GM812 Intelligent Video Controller card features an on board Z80A processor to provide independence of the host processor and the ability to redefine the functions and parameters of the display.

Normally used in an 80 x 25 mode the card contains a programmable character generator allowing three additional modes of operation – inverse characters, 160 x 75 block graphics, or user defined characters.

A keyboard socket allows buffered character input, and a light pen socket is provided for specialist applications. Being I/O mapped the card does not occupy any system memory space.

GM 809 FDC

The GM809 floppy disk controller card can support up to four disk drives in either single or double density modes. The card uses the Western Digital 1797 controller and has variable write precompensation and phase locked loop data recovery circuitry.

GM 815 DRIVE UNIT

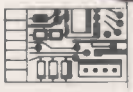
GM 815 Drive unit

The GM815 floppy disk housing contains one or two 5¼" double density, double sided Pertec FD 250 drives. This gives a storage capacity of 350K per drive. Power for the drives is provided by an integral supply unit.

AUTO-EXCHANGE
All your RP/M software automatically transferred to CP/M

GM 802 RAM

The GM802 RAM board provides a full 64K of dynamic memory. The 80 BUS RAMDIS signal is fully supported so that any EPROM in the system is given priority over the RAM, preventing any possibility of bus contention. Page Mode is also supported by the card which, with the appropriate software, allows up to four memory boards to be used in a system.



FILL-UP WITH SOFTWARE

RP/M

RP/M software is available on tape and includes Editor/Assembler; Text Editor/Formatter; Disassembler/Debugger; Pascal and Comal-80. These packages can also be run under CP/M.

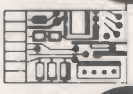
CP/M 2·2

A CP/M 2.2 package is available with the GM 809 card and Pertec drives. On-screen editing auto single/double density selection and parallel or serial printers are supported. Running under CP/M is a wide range of utilities, application software and languages.

ONE WAY

GM 803 EPROM BOARD

The GM803 Eprom Board will accept up to 16 2708 or 2716 Eprom devices. This allows the addition of up to 32K of firmware to the system. The board supports the Page Mode system and consequently need not occupy any memory space when not in use.



QM 816 I/O BOARD

The Quantum Micro I/O board provides a unique solution for interfacing to "the real world". The board contains 3 PIO's, a CTC and a real time clock with battery back up. "Daughter" boards may also be added and these include A-D, D-A, opto-coupling and serial interface boards.

A number of manufacturers are busy working on additional 80-BUS boards which will progressively increase the potential of your MultiBoard system.

MEN AT WORK

PROTO-TYPING BOARDS

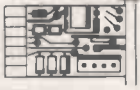
80 BUS compatible prototyping boards are available from both Vero and Winchester Technology. These allow the user to easily add a card of their own design to the system.

GM 808 EPROM PROGRAMMER

The GM808 Eprom programmer connects to the PIO on the CPU card and allows the user to program 2708 or 2716 type Eproms.

AM 819 SPEECH BOARD

The Arfon Microelectronics speech board utilises the National Semiconductor Digitalker chip set. This gives a vocabulary of over 140 words and sub sounds. Output is from an on-board speaker.



AM 820 LIGHT PEN

This low cost light pen can be used with the GM812 IVC for many applications, including answer selection, editing, menu selection and movement of displayed data blocks.

EV 814 IEEE 488

The EVC IEEE 488 Controller card has been designed to fully implement all IEEE 488 interface functions. This card gives the user a very versatile method of controlling any equipment fitted with a standard IEEE 488 or GPIB interface at minimal cost.

GEMINI MULTIBOARDS –BUY THEM AT YOUR LOCAL MICROVALUE DEALER

All the products on these two pages are available while stocks last from the MicroValue dealers listed on right (Mail order enquires should telephone for delivery dates and post and packing costs.) Access and Barclaycard welcome.

INTERFACE COMPONENTS LTD.
Oakfield Corner, Sycamore Road, Amersham, Bucks.
Tel:(02403) 22307. Tlx:837788.

COMPUTER INTERFACING & EQUIPMENT LTD.,
The MICRO-SPARES Shop,
19 Roseburn Terrace,
Edinburgh EH12 5NG
Tel: (031) 337 5611

ELECTROVALUE LTD.
700 Burnage Lane, Burnage, Manchester M19 1NA.
Tel:(061) 431 4866.

28 St Judes, Englefield Green, Egham, Surrey TW20 0HB.
Tel:(0784) 33603. Tlx:264475.

SKYTRONICS,
2 North Road, The Park, Nottingham.
Tel: (0602) 45053/45215

TARGET ELECTRONICS
16 Cherry Lane, Bristol BS1 3NG.
Tel:(0272) 421196.

BITS & PC'S
4 Westgate, Wetherby, W.Yorks.
Tel:(0937) 63774.

HENRY'S RADIO
404 Edgware Road, London W2.
Tel:(01) 402 6822.
Tlx:262284 (quote ref:1400).

LEEDS COMPUTER CENTRE,
62 The Balcony, Merrion Centre, Leeds.
Tel: (0532) 458877

● Circle No. 106

MPI MICRO COMPUTER PRODUCTS INTERNATIONAL LTD.

Retailer and OEM terms available

Full descriptive Catalogue: available £1 — deductable from first purchase

SOFTWARE FOR CP/M COMPUTERS INCLUDING

CROMEMCO Z2D	COMART COMMUNICATOR	RESEARCH MACHINES	
EXCIDY SORCERER	COMART EDUCATOR	GEMINI	OTHER
SUPERBRAIN	RAIR BLACK BOX	TRANSAM TUSCAN	FORMATS
VECTOR MZ	SD SYSTEMS	XEROX 820	AVAILABLE
NORTH STAR HORIZON	NASCOM	*+8" IBM FORMAT*	

	Software & Manual	Manual Only
BYROM SOFTWARE		
BSTAM—Utility to link one micro-computer to another also using BSTAM	£95	£6
BSTMS—Utility to link a micro to a mini or mainframe	£95	£11
CP/M USER LIBRARY		
51 Volumes—Price per volume		
8" disc (one volume per disc)	£5	
5" disc (one volume per 2 discs)	£10	
Index	£2	
CREATIVE COMPUTING		
BASIC Games Volume 1	£14	
BASIC Games Volume 2	£14	
More BASIC Games Volume 1	£14	
More BASIC Games Volume 2	£14	
DIGITAL RESEARCH		
CBASIC v 2.08	£65	£15
MPM 1.1	£195	£20
MPM 2.0	£250	£30
CP/M86	£160	£27
CP/M 2.2	£95	£20
CP/NET	£120	£14
SID	£50	£14
ZSID	£55	£14
MAC	£60	£14
TEX	£50	£14
DESPOOL	£33	£6
PL/1	£300	£27
BT-80	£140	£20
INFORMATION UNLIMITED		
WHATSIT (Database Management System)	£80	
KLH SYSTEMS		
Spooler for CPM systems v3.0	£70	£6
MPI LTD.		
FORTH	£72	£20
PAYROLL	£500	£15
SALES LEDGER	£200	£15
PURCHASE LEDGER	£200	£15
NOMINAL LEDGER	£200	£15
INCOMPLETE RECORDS	£1200	£20
MICROFOCUS		
CIS COBOL version 4.4	£400	£25
FORMS 2 v11	£100	£10
MICROLOGY		
FTNUMB (FORTRAN-80 RENUMBER & REFORMATTER)	£50	£5
MICROPRO INC.		
WORD-MASTER 1.7A	£75	£22
TEX-WRITER 2.6	£37	£17
WORDSTAR 3.0	£250	£38
MAIL MERGE 3.0 (requires Wordstar)	£75	£10
SPELLSTAR 1.0 (requires Wordstar)	£125	£10
WORDSTAR TRAINING MANUAL		£18
WORDSTAR CUSTOMIZATION NOTES	£50	
SUPER-SORT 1.6: Version 1	£125	£22
Version 2	£110	£22
DATASTAR 1.101	£175	£25
CALCSTAR	£150	£25

	Software & Manual	Manual Only
MICROSOFT INC.		
BASIC-80 5.21	£185	
BASIC Compiler 5.3	£205	
FORTRAN-80 3.43	£260	
COBOL-80 4.01	£380	
M/SORT 1.01	£75	
EDIT-80 2.02	£65	
MACRO-80 3.43	£105	
MULISP 2.10	£105	
MUMATH 2.10	£130	
MICROTECH EXPORTS		
REFORMATTER		
CPM ↔ IBM	£98	£17
CPM ↔ DEC	£98	£17
MT MICROSYSTEMS		
PASCAL MT+ 5.25	£150	£25
PASCAL MT+ 5.25 with SPP	£265	£50
Library Sources	£110	
Speed Programming Pkge. (Softbus)	£125	£25
OSBORNE & ASSOCIATES		
ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE	£50	£15
GENERAL LEDGER	£50	£15
PHOENIX SOFTWARE ASSOCIATES (For Z80 only)		
PLINK—Disc to disc link loader	£72	£15
PASM—Macro Assembler	£72	£15
PEDIT—Line editor with Macros	£72	£15
BUG—Very powerful debug	£72	£15
PDEVELOP Package with all the above	£193	£33
PLINK—2 Overlay Link Loader	£185	£15

	Software & Manual	Manual Only
STRUCTURED SYSTEMS (All converted to UK Standard)		
SALES LEDGER	£350	£20
PURCHASE LEDGER	£350	£20
NOMINAL LEDGER	£350	£20
STOCK CONTROL	£350	£20
LETTERIGHT	£95	£11
ANALYST (File management Reporting System)	£125	£11
NAD (Name and Address selection system)	£55	£11
QSORT	£55	£11
SUPERSOFT INC.		
DIAGNOSTICS 1	£45	£9
DIAGNOSTICS 2	£55	£9
TERM	£72	£7
TDL SOFTWARE (Technical Design Labs)		
BUSINESS BASIC	£80	
ZTEL (Text Editing Lang.)	£35	
LINKER	£35	
TINY-C ASSOCIATES		
Tiny-C language for 8080, 8085, Z80 systems	£55	£39

NEW PRODUCTS

MICROPRO		
INFOSTAR	TBA	
FOX & GELLER		
QUICKSCREEN	£87	£12
MICRO-AP		
SELECTOR V	£275	£25
DIGITAL RESEARCH		
CB-80	TBA	
XLT-86	TBA	
CBASIC-86	TBA	

BASF DISCS

The following formats are available from stock: 8" SSSD 5¼" Soft Sectored, 5¼" 10 Sectors, 5¼" 16 Sectors

Quantity	Price Per Disc Ex VAT
1 - 50	£2.40
51 - 100	£2.00
101 - 200	£1.80
201 - 500	£1.70
501 -	£1.50

Minimum order quantity 10 discs. Orders must be in multiples of 10. Postage, Package & Insurance 86p per 10 Discs up to 50 Discs thereafter 17p per 10. Other formats on request.

ORDER INFORMATION

When ordering CP/M software please specify the format you require otherwise software will be despatched on an 8" single density disc.

All software items are subject to VAT. Manuals, when purchased separately, are not subject to VAT.

Please add £3.45 for postage, packing and insurance on each item purchased. For overseas please add £6.50 per item.

Most software in this advertisement is available from stock and a 72 hour return service is thereby offered on most prepaid orders.

These details and prices are all current as of January 1982. Our prices reflect an exchange rate of U.S. $2.00 to £1.00. Should the exchange rate vary by more than 5 cents, a surcharge may be added or a discount given.

MAIL ORDER TELEPHONE ORDER VISIT

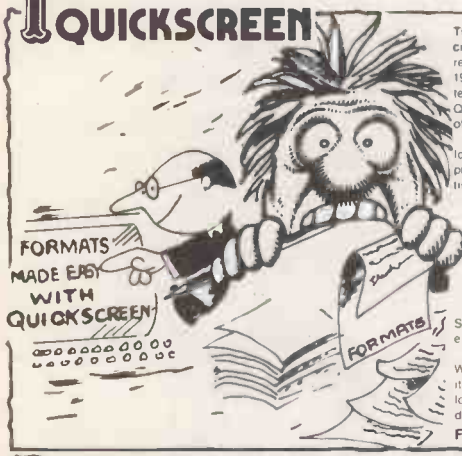
Send Cash, Cheque, Postal Order, IMO, Access or Barclaycard/Visa number to Microcomputer Products International Ltd., Room PC11, Cambridge House, Cambridge Road, Barking, Essex IG11 8NT.
All payments must be in Sterling and drawn against a U.K. bank.

QUALITY PRODUCTS FROM THE HOME OF MICROCOMPUTER SOFTWARE

MPI

4 GOOD REASONS TO RING 01~591 6511

1 QUICKSCREEN



The purpose of QUICKSCREEN is to provide a simple, carefree way for people to create screen forms on the computer. The uses for these forms can be as varied as the reasons people buy computers. With the computer revolution that has occurred since 1975, computers are finding their way onto the desks of managers, professionals, teachers, and students. M.P.I. Ltd. welcomes this development. We hope that QUICKSCREEN will find a home on all those desks and help everyone to get more out of their computer.

Ideally, information should be displayed clearly, with titles, headings and other punctuation. However, in most computer programming languages, this is clumsy and time-consuming.

For each phrase, word, or title, you must identify the exact line and column where it appears. Then you must type each of these locations into the computer. Once you see the results on your VDU, you may not like the appearance, so you would want to rearrange things. This means you will have to recalculate all the line and column locations and type them in again.

Sound like a waste of time? Fortunately, you will never have to go through that exercise again.

With QUICKSCREEN, you simply type the form on your screen just as you would like it to appear. Then let QUICKSCREEN do the rest. It will automatically calculate the locations of everything, and automatically write a computer program for you, which will display your form and allow you to begin entering information immediately.

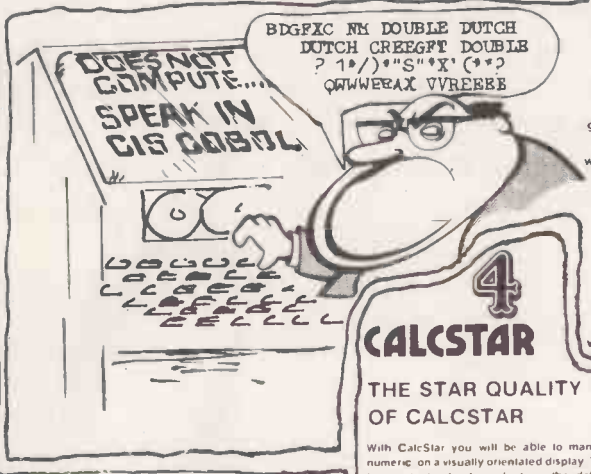
For Use With BASIC-80, CBASIC, DBASE-II, or FMS-80

2 CIS COBOL

WITH FORMS-2

The CIS COBOL product family brings you the most successful business programming tool ever devised, COBOL, in a form optimized for today's most cost effective hardware, the microcomputer. Standard COBOL as defined by ANSI X3.23-1974. The reliability and performance of CIS COBOL are strongly emphasized by its' continued qualification for U.S. government contracts. In January 1981 CIS COBOL entered its 2nd year of G.S.A. certification. CIS COBOL is powerful but simple to use. Its screenhandling, dynamic module loading and fast ISAM let you take full benefit from micro computer facilities. The FORMS-2 utility is a COBOL source code generator to help you build interactive applications with ease. Using the unique demonstration "How to create a COBOL program in 20 minutes," you can quickly try out new application ideas. And if you are developing software for resale, the variety of systems running CIS COBOL offers you a very large available market.

3 SELECTOR V



is a totally self-contained system providing complete data, procedural, query, and report definition functions. It allows records to be managed on a one-for-one basis as well as in 'batch' mode where several files can communicate with each other in a variety of ways. It uses the capabilities of an addressable terminal making the entry and editing of data and definitions, smoothly efficient.

The facets that make **SELECTOR V** more functional than any other system of its kind include:

MULTIPLE 'KEY FIELDS'

Of the up to 80 data fields each record can contain, any or all may be assigned to be 'keys' so that records can be recalled individually or consecutively, by the contents of those fields.

BATCH, MULTIPLE FILE PROCESSING

SELECTOR V can process records from several different files at the same time. It can freely move information from one file to another. It can do it on a conditional basis, can arithmetically process one field against another or a constant value, it can convert MANAGER to MGR, delete redundant records, multiple the QUANTITY in a Transaction file against the STOCK PRICE of inventory records, add the results to a Receivables file, and update a Journal file, all as the result of a simple procedure definition that can be executed whenever needed.

DATA DEFINITIONS

Records can be structured just as you require. Files can be re-defined and converted as necessity dictates.

SELECTION UTILITIES

SELECTOR V allows records to be selected, in any order according to the most definitive, compoundable criteria either for reporting purposes, or to create uniquely defined new data bases. It can conditionally transform records into new formats and perform arithmetic procedures in the process.

REPORTS

With two report generators at your disposal, your data can be made absolutely productive. Both allow inputs from several different files, with conditional and arithmetical processing. The first is oriented to reporting to you about your data. We take care of the formatting. You just specify what information you want. You can designate up to 80 actual and derived fields to be reported upon.

The second report generator produces output in any form that you want. Anything from gummed labels, to dated, automatically sequentially numbered invoices, complete with text paragraphs, can be produced on printed continuous forms of plain paper.

APPLICATIONS DEVELOPMENT SYSTEM

SELECTOR V is primarily geared towards managing dedicated integrated applications. With its multi-file, conditional arithmetical processing abilities, it will handle a variety of complex tasks with ease. No language coding is required. Procedures are defined as named definitions and can be executed as needed.

4 CALCSTAR

THE STAR QUALITY FEATURES OF CALCSTAR

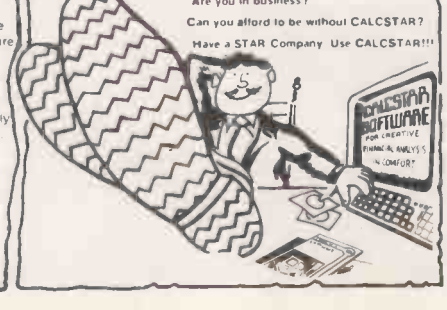
With CalcStar you will be able to manipulate data, either text or numeric, on a visually orientated display. The numeric data may either be constant or be dependant on other data. CalcStar has facilities for editing, formatting, storing, calculating and printing all data. This is a true electronic worksheet, with 127 columns and 255 rows. Uses include:-

Balance Statements • Cash Flow Analysis and Forecasting • General Ledger • Inventory Records • Jobs Cost Estimates • Market Share Analysis and Planning • Patient Records • Profit Projections • Profit Statements • Profit Budgeting and Control • Salary Records • Sales Projects and Records • Tax Estimation etc.

Are you in business?

Can you afford to be without CALCSTAR?

Have a STAR Company Use CALCSTAR!!!



MAIL ORDER

TELE-PHONE

CREDIT CARD ORDER

★ VISIT ★

Trade Enquiries Welcome

ROOM PC, 11 CAMBRIDGE HOUSE, CAMBRIDGE ROAD, BARKING, ESSEX IG11 8NT, ENGLAND
Telephone: 01-591 6511 Telex: 892395

● Circle No. 107

April 23-25, 1982
Earls Court, London

Friday & Saturday: 10am – 6pm
Sunday: 10am – 5pm

Admission £2.00 adults
£1.00 children under 16.

THE Computer Fair

Personal computers
Home computing
Small business systems

The computer is with us and soon to be as familiar in the home as your television, video or hi-fi. But much more versatile!

A home computer can be the family's resident teacher, accountant, home economics expert, memory bank and endless source of amusement! It can do anything you programme it to do – from teaching mathematics to the children or computing the most economic use of household fuels for yourself, as well as providing hours of fun on a rainy afternoon. Most important of all, the home computer will teach you and your family about computers – and this is the technology that your children are growing up with.

In the office, the personal computer is rapidly replacing the obsolete mound of box files, adding machines and notebooks on thousands of desk tops. Microchip streamlining means increased efficiency in hundreds of different fields.

adult

THE Computer Fair
Personal computers
Home computing
Small business systems

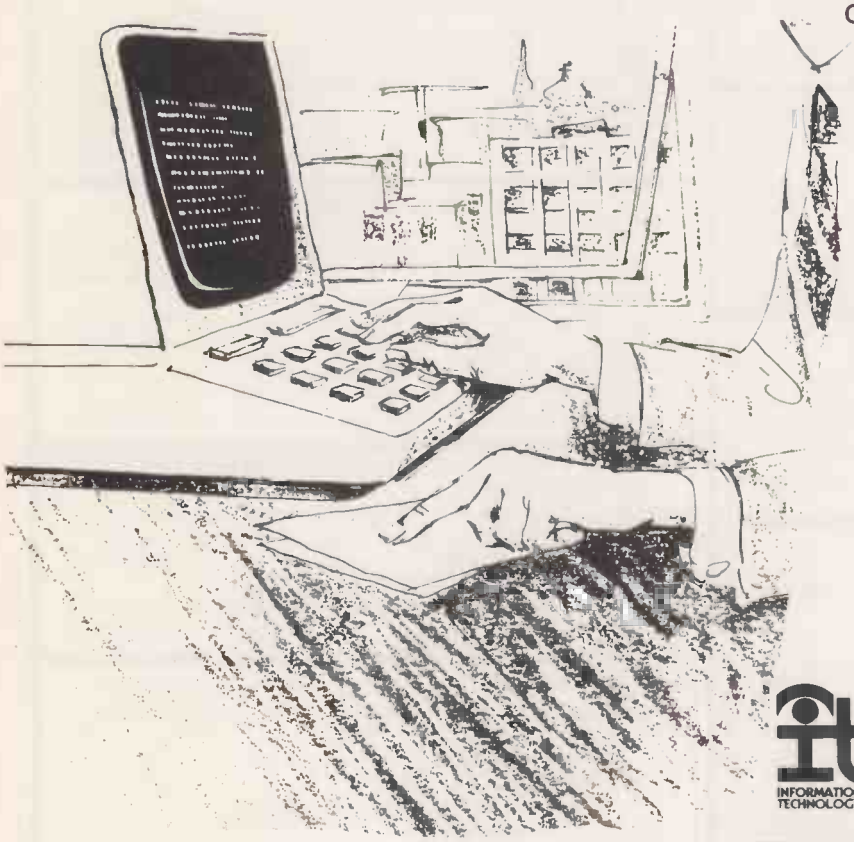
Cut this coupon and exchange for half-price ticket at the door.

HALF PRICE ADMISSION VOUCHERS

Bringing computers to everyday life

At The Computer Fair you can see and compare an enormous range of personal and home computers. Find out what they can do and which one would suit you best. Talk to the experts and discover for yourself how much – or how little – you need to spend. Choose from an amazing abundance of software programs and packages, cassette units, VDU terminals and scores of computer games.

Swap your views and know-how with hundreds of other home computer enthusiasts – and find out a whole lot more from computer professionals.



Plus – The Micro Mouse Contest.

Come and watch the incredible ingenuity of computer controlled "mice" and how they find their way (or not!) to the centre of a maze. The knockout heats and the Euromicro British Final can all be seen at The Computer Fair!

Bring the whole family – don't miss this opportunity of bringing computers into your everyday life.

it INFORMATION TECHNOLOGY 82

for readers of Practical Computing

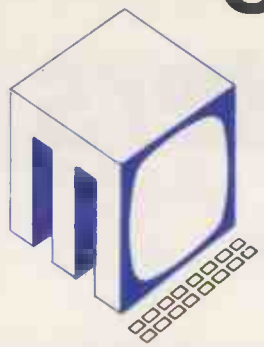
child

THE Computer Fair

Personal computers
Home computing
Small business systems

Cut this coupon and exchange for half-price ticket at the door.

CP/M SOFTWARE



from

METROTECH

CALCSTAR

N E W

CalcStar is MicroPro's new electronic Spread sheet and financial modelling Program — a sophisticated, yet easy to use calculating and planning tool. CalcStar also links with WordStar, so you can easily include your final calculations within your report.

CALCSTAR £140/£20

BCPL

N E W

BCPL CINTCODE is full and extended implementation of the popular Systems programming language BCPL. CINTCODE gives a dramatic reduction in the space required for programs, requiring about a third the storage of fully compiled Z80 code.

BCPL £250/£35

* NEW * WORDSTAR 3 * NEW *

WORD-STAR[tml] Version 3.xx has now been released. New features include: column move capabilities, horizontal scrolling — up to 240 columns and even clearer menus. Also released is MicroPro's own spelling checker — SPELLSTAR.

WORD-STAR 3.xx	**£255/£30**
MAILMERGE 3.xx (optional)	**£ 60/£10**
SPELLSTAR (optional)	**£125/£10**

IN ADDITION METROTECH SUPPLIES A TRUE ENGLISH DICTIONARY, REPLACING US WORDS WITH ENGLISH

NEW * RECORDS MANAGEMENT * NEW

Ideal for office records including personnel, stock, clients and accounts. Features include:

* Comprehensive calculation
* Record selection on updates and reports
* Full sorting facilities
* WORDSTAR INTERFACE — for selective mailing

COMPSOFT DMS £400/£25

NEW * MICROPLAN * NEW

If you have any problem that you would normally solve with pen, paper and a calculator, then MicroPlan will help you. MicroPlan will perform most types of calculations working in rows and columns, as well as advanced financial analysis.

MicroPlan £295/£20

LANGUAGES/UTILITIES

CBASIC II COMMERCIAL DISK EXTENDED BASIC	£75/ £20
SBASIC COMPILER STRUCTURED BASIC	£175/ £30
SUPERSORT I	£125/ £20
WORD-MASTER SUPERIOR TEXT EDITOR	£75/ £20
MET/ TWAM INDEX SEQUENTIAL FILE ACCESS IN CBASIC II	£55/ £15
MICROSOFT BASIC 80 INTERPRETER	£155/ £25
MICROSOFT BASIC COMPILER	£195/ £25
MICROSOFT FORTRAN 80	£215/ £25
MICROSOFT COBOL 80	£315/ £25

MICRO DATA BASE SYSTEMS

MDBS is a database system offering full network CODASYL-oriented data structures, variable length records, read/write protection, one-to-one, one-to-many and many-to-many set relationships. Add on features are: an interactive report-writer and query system, a dynamic restructuring system and a recovery-transaction logging system.

MDBS prices start from £600/£30
Primer manual £5

COMMUNICATIONS

BISYNC-80/3780 and **BISYNC-80/3270** are full function IBM 2780/3780 and 3270 emulators for microcomputers.

BISYNC-80/3780 gives you a Remote Job Entry terminal for the price of a micro!

BISYNC-80/3270 combines the local processing power of a micro with a sophisticated screen capability. Make your dumb terminal smart!

MET/TTY will connect your micro to a timesharing service in simple teletype emulation.

BISYNC-80/3780	**£445/£15**
BISYNC-80/3270	**£445/£15**
MET/TTY	**£ 95/£15**

DATA MANAGEMENT

SELECTOR III-C2
An easy to use Information Management System; requires CBASIC II £185/£30

SELECTOR IV
An advanced Information Management System; requires CBASIC II £275/£35

DATASTAR
Powerful data entry, retrieval and update system £195/£30

FINANCIAL REPORTING

REPORT WRITER
You input the values — Report Writer will perform your calculations and produce a report with your headings, totals and summaries £95/ £15

GLECTOR
General ledger option to Selector III; Requires Selector III and CBASIC II £185/ £30

All software is **Ex-stock** except MDBS and available on standard 8" disks or 5" disks for Vector MZ, Superbrain, Dynabyte and NEC.

* Postage and Packing £2 per order.
* Add 15% VAT.
* State which disk type and size.
* All orders prepaid.

Telephone orders welcome for Access, Barclaycard, American Express or Diners Club.
CALL 0895 58111 Ext. 247 or 269
or write to:

METROTECH MAIL ORDER
WATERLOO ROAD UXBRIDGE
MIDDLESEX UB8 2YW

enclosing cheque, PO's payable to METROTECH

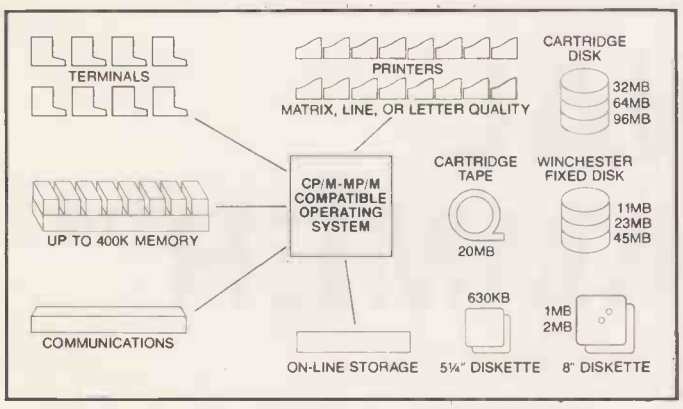
tml WORD-STAR is a trademark of Micropro.

Most software now available for NEC.

Prices are shown as Software with manual/Manual only.
Prices correct at time of going to press

METROTECH are sole U.K. distributors of DYNABYTE microcomputer systems.

CP/M HARDWARE
FROM
METROTECH



The basic Dynabyte features 64K RAM, a 4MHZ Z80A, and one parallel and two serial ports. All systems run CP/M, MP/M and CP/NET.

A full range of software is available including word processing communications, database, integrated business systems, all standard languages and viewdata.

DYNABYTE

Upgradeable

When you install a Dynabyte system, you're not just buying the system you need today, you're planning for the future. As your business expands and your needs change and grow, you simply add processing power and storage capacity — unit by unit, in a measured building block fashion. The Dynabyte systems provide the total solution for both your data processing and word processing needs.

DYNABYTE

Modularly Expandable

The Dynabyte 5000 Family allows a very wide range of disk storage and can be configured to give multi-terminal and multi-tasking systems, net working and multiple processors. The net result is a system that serves your present needs exactly and is modularly expandable to meet your future demands.

DYNABYTE

Choice of Storage

Choose from nine different members of the Dynabyte Family, and get the amount of storage you require — ranging from 630 thousand bytes to 99 million bytes. Capacity, versatility, and compatibility can all be part of the selection criteria. You don't have to compromise with a Dynabyte.

DYNABYTE

Multi-tasking

Attach up to eight terminals to your microcomputer. Run several jobs from one terminal simultaneously (up to eight at one time). Connect up to 16 printers. Share the processor, share the printers. Add one terminal, one printer, or a block of memory. It is all possible when you install a Dynabyte's Level 4 operating system, a superset of MP/M, on your Dynabyte's equipment.

DYNABYTE

Flexible

The flexibility built into every Dynabyte computer assures you a smooth upgrade path, and it vastly extends the useful life of your equipment. Upgradeability can mean a lot to you — wasted time and disruption are eliminated with a smooth transition to a large Dynabyte system.

Please send more information on the Dynabyte 5000 series

Name .....

Title .....

Address .....

.....

Telephone .....

SEND TO: METROTECH LTD., MARKETING DEPT., WATERLOO ROAD, UXBRIDGE, MIDDLESEX UB8 2YW. TEL: 0895 58111 Exts 265, 287, 247 or 269.

METROTECH IS A MEMBER OF THE GRAND METROPOLITAN GROUP.

● **Circle No. 108**

WITH INTERNATIONAL ACCLAIM

PEARL™

Paved the way with Program Generators

Now once again Pearl Leads with

PERSONAL PROGRAMMER™

The Evolution in Software
1990's in 1982

It does what others are claiming

TM. RELATIONAL SYSTEMS INTERNATIONAL
SALEM, OREGON

PERSONAL PROGRAMMER™

Create All the Business Programs You Want
Enjoy You Computer Working for You
Empower Your Ideas with Personal Programmer —
The Newest PEARL
The Program That Shows You Why Everyone Will Want a Computer

No More Blind Alleys trying to figure out what programs to buy when none seem to be exactly what you need. Why waste time and money trying to decide how to develop custom programs when programmers are so expensive, and good ones are rare?

Why Go Through the Hassle of trying to find someone else to develop the program you need? Avoid the worry about whether the computer program is going to operate according to your requirements.

Even If You are a Professional Application Programmer, why waste your time coding in a computer language and debugging when Personal Programmer will do the work for you? You can use your problem-solving abilities to solve your customers' problems.

Why Purchase Several Different Programs designed for a variety of computer users? Particularly when you so often would like the programs to work in the same manner and to work together.

Have you wondered what you could accomplish if only you could put your ideas immediately to work? You cannot experience your true potential unless you have the resources to accomplish what you are capable of doing.

Unlock the Power of Your Computer. Personal Programmer is for use by people, all people, not just programmers. You can use PEARL Personal Programmer to create custom programs. As quickly as you can identify your program requirements, in English, Personal Programmer writes the new program for you.

You Know What You Need Better than Anyone Else. Use Personal Programmer to unlock your problem-solving abilities. Personal Programmer is the natural, human way to create new computer solutions.

Use Your Time Wisely Making a Profit. Profit comes from solving business problems and serving your customer, not from solving computer programming problems. Personal Programmer asks you for examples of the results you require from your computer. Personal Programmer then produces the application program.

Create a Library of Personal Programs, each tailored to your personal requirements. Accounting, cash disbursement, mailing lists, data files, data management, calculation reporting. You name it. Literally. Personal Programmer builds the program library of your choice, your way, for one price.

Empower Your Ideas through the capabilities of Personal Programmer. There is no limit to the number or variety of programs you can create. There are no artificial, technical limits built into Personal Programmer such as the number of records in a file, or record size, or the computer language used. Personal Programmer creates ready-to-run, high quality programs that do what you want.

Currently available for CP/M with 48K: other versions following.

Price at under £200 exclusive of VAT. For further details contact your local dealer or mail the form below.

Manufacture, OEM and dealer enquiries welcome.

To: **PEARL INTERNATIONAL (UK) LTD, 15 GLENAIR RD, POOLE, DORSET BH14 8AA.**

Please send me details of **PERSONAL PROGRAMMER.**

Name ..... *Firm* .....

Address ..... *Post Code* .....

Type of Equipment .....

Disc Size & Format .....

● **Circle No. 109**

But the real beauty of the CompuStar is its "shared logic" design concept. Each user station contains its own distinct microprocessor and RAM. The result is lightning fast program execution. Even when all 16 users are on-line. Even when all are performing different tasks! A special multiplexor circuit in the CompuStar ties all external users together to "share" the system's disk resources so that no single user ever need wait on another. An incredibly exciting concept!

A remarkable breakthrough in price/performance, the CompuStar boasts nearly 1 megabyte of on-line mini-disk storage (almost 2 megabytes on CompuStar II) and can be easily expanded to 20, 36 or 96 megabytes of hard-disk in just seconds. And since each user station can accommodate up to 64K or RAM, a total of over one million bytes can be incorporated into the system to tackle even your most difficult programming tasks.

CompuStar user stations can be configured in a countless number of ways. A series of three intelligent-type terminals are offered. Each is a perfect cosmetic and electrical match to the system. The CompuStar 10 - a 32K programmable RAM-based terminal (expandable to 64K) is just right if your requirement is a data entry or inquiry/response application. And, if your terminal needs are more sophisticated, select either our CompuStar 20 or CompuStar 40 as user stations. Both units offer dual disk storage in addition to the disk system in the CompuStar. The Model 20 features 32K of RAM (expandable to 64K) and 350K of disk storage. The Model 40 comes equipped with 64K of RAM and over 700K of disk storage. But, most importantly, no matter what your investment in hardware, the possibility of obsolence or incompatibility is completely eliminated since user stations can be configured in any fashion you like - whenever you want.

Our New CompuStarTM 10 Megabyte Disk Storage System (called a DSS) features an 8 inch Winchester drive packaged in an attractive, compact desktop enclosure. Complete with disk, controller and power supply. Just plug it into the Z80 adaptor of your SuperBrain and turn it on. It's so quiet, you'll hardly know it's there. But, you'll quickly be astounded with its awesome power and amazing speed. The secret behind our CompuStar DSS is its unique controller/multiplexor. It allows many terminals to "share" the resources of a single disk. So, not only can you use the DSS with your SuperBrain, you can configure multiple user stations using our new series of CompuStarTM terminals, called Video Processing Units of VPU'sTM.

G.W. COMPUTERS LTD, 01-636 8210 01-631 4818

*** THE NEW DBMS (DATABASE) ***

DBMS2 is a *record relational* as well as a *file relational* database management tool that is capable of being at different times, many different things. The one core program can be set up to perform tasks normally associated with the following list.

Accounting	Budgeting	Cashflow
Stock control	Address mailing	Letter writing
Simulations	Time recording	Filing
Calc-type predictions	Hospital indexing	Profit analysis
Bureaux services	General analysis	Mathematics
Answer *what-if's*	Employees records	Tabulate values
Print reports	Sort files	Edit records

Within hours perform all the above in **French** or **German**.
The list is as endless as that which meets the requirements of your own imagination.
Within the appropriate frames of reference you could ask questions like the following:
Find someone whose name begins with W, who is either in London or Birmingham, and available for work at a salary of less than 10,000.00; and is under 40 years of age, not married, of credit worthiness grade 1, with a car, prepared to travel, and who likes horses, does not mind the hours he works, is congenial and has good references. **When you find such persons** produce a printed list of them showing their names, telephone numbers, and what their salaries are as well as their salary if **increased by 10%** and show their availability for work. At the end of the list enumerate the total of such persons.
Find all stock items that are codes *micro-computers* that are either in warehouse 1 or warehouse 2, where the quantity on hand is more than 50 units, the cost is less than 1000.00, the selling price higher than 2000.00; that are not in cartons, bought from supplier 52, allocated more than 20, rated for tax at .15% and weigh less than 50 lbs. **When you find such categories** then print a report showing the description, cost price, quantity on hand, lead time for refills, what the selling price *should be if raised by 12.3%* as well as the profit in either percent or round figures of that projected selling price.
Find all patients who suffered from cold, that are either girls or women younger than 23 years old, and who live in London at a socio-economic grade higher than 3; do not smoke; have more than 3 children, are currently at work and where treatment failed to effect a cure in under 6 days. **When you find such persons** then print a list showing their age, marital status, income, and frequency of illness in the past 2 years.
Currently you can ask *5 types* of questions *20 times* for a single selection criterion, and then you can compute *10 mathematical relationships* between the questions for the individual *as well as* for the total number of matches. In all some 60 bits of information relating to one record or a group or records on simply one permutation of the selection criterion, with a cross referencing facility as well.
Every word in the system, as well as the file architectures, print masks, and field attributes, is capable of alteration by you *without* programming expertise (but with some thought).
ALL IN ONE PROGRAM FROM G.W. COMPUTERS. THE DBMS2 !!.

G.W. COMPUTERS LTD, 01-636 8210 01-631 4818

*** ALL YOU NEED FROM A COMPUTER SYSTEM ***

DATABASE MANAGEMENT + WORD-PROCESSING + MODELLING + DIY INTERPRETER + SERVICE

TWO TYPICAL PACKAGE DEALS	NORMALLY		NORMALLY
01 — SUPERBRAIN 64K RAM 320 K	1950.00	01 — SUPERBRAIN OR N/STAR QD	2395.00
02 — EPSON MX80 FT (OR SIMILAR)	475.00	02 — NEC 5510 (OR SIMILAR)	1695.00
03 — CABLE	25.00	03 — CABLE ADAPTER	25.00
04 — 12 MONTH WARRANTY	235.00	04 — 12 MONTH WARRANTY	410.00
05 — DELIVERY IN U.K.	40.00	05 — DELIVERY IN U.K.	50.00
06 — TRAINING SESSION	50.00	06 — TRAINING SESSION	50.00
07 — CPM HANDBOOK	8.75	07 — CPM HANDBOOK	8.75
08 — 50 BASIC EXERCISES	8.75	08 — 50 BASIS EXERCISES	8.75
09 — BOX PAPER (2000 SHEETS)	20.00	09 — BOX PAPER (2000 SHEETS)	20.00
10 — DBMS2 (DATABASE)	575.00	10 — DBMS2 (DATABASE)	575.00
11 — MAGIC WAND	190.00	11 — MAGIC WAND	190.00
12 — MBASIC-80	150.00	12 — MBASIC-80	150.00
13 — SUPER CALC	150.00	13 — SUPER CALC	150.00
14 — 40 MEMOREX DISKETTES	114.00	14 — 25 DYSAN D/SIDE DISKETTES	150.00
15 — DOS+ AND DIAGNOSTICS	125.00	15 — DOS+ AND DIAGNOSTICS	125.00
16 — MSORT & DSORT	75.00	16 — MSORT & DSORT	75.00
17 — RECOVER + AUTOLOAD	25.00	17 — RECOVER + AUTOLOAD	25.00
18 — INSTANT BASIC	9.00	18 — INSTANT BASIC	9.00
(NOT INC VAT)	4225.50	(NOT INC VAT)	6220.50
OUR PRICE	2995.00	OUR PRICE	4950.00

(NOTE: ITEMS 1 AND 2 ARE MORE FLEXIBLE)

EXTRA SPECIAL SUPERBRAIN PROGRAM MAIL ORDER OFFER OF THE 5 MAIN PROGRAMS
DBMS2 + SORTS + MAGIC WAND + MBASIC 80 + SUPER-CALC NORMALLY 1140 POUNDS

OUR PRICE * * * * * * 595.00 * * * * * * +VAT

WARRANTY NOTE: WE HANDLE ALL REPAIRS OURSELVES.
WARRANTY COVERS FREE REPLACEMENT EQUIPMENT IF DEFECTIVE IN FIRST THREE WEEKS.
THEREAFTER UP TO 12 MONTHS THE COVER PROVIDES INSURANCE ON ALL SPARE PARTS AND LABOUR COSTS (EXCLUDING CARRIAGE).
CALL OUT MAINTENANCE IS ALSO AVAILABLE AT 25.00 MINIMUM (LONDON) 50.00 MINIMUM ELSEWHERE IN U.K. PLUS MILEAGE.

**CALL ONLY BY APPOINTMENT AT 55 BEDFORD COURT MANSION,
BEDFORD AVENUE, LONDON W.C.1. TELEX 892031 TWC G**

SuperBrain users get exceptional performance for just a fraction of what they'd expect to pay. Standard SuperBrain features include: two double density mini-floppies with 350K bytes of disk storage, 32K of ram memory (expandable to 64K) to handle even the most sophisticated programs, a CP/M® Disk Operating System with a high powered text editor, assembler, debugger and a disk formator. And, with SuperBrain's S-100 bus adaptor, you can add all the programming power you will ever need . . . almost any type of S-100 compatible bus accessory.

SuperBrain's CP/M operating system boasts an overwhelming amount of available software in BASIC, FORTRAN, COBOL, and APL. Whatever your application . . . General Ledger, Accounts Receivable, Payroll, Inventory or Word Processing, SuperBrain is tops in its class. And the SuperBrain QD boasts the same powerful performance but also features a double-sided drive system to render more than 700K bytes of disk storage and a full 64K of RAM. All standard!

Whatever model you choose, you'll appreciate the careful attention given to every engineering detail. A full ACSII keyboard with numeric pad and user-programmable function keys. A non-glare, specially focused, 12-inch CRT for sharp images everywhere on the screen. Twin Z-80 microprocessors to ensure efficient data transfer to auxiliary peripheral devices. Dual universal RS-232 communications ports for serial data transmission. And, a single board design to make servicing a snap!

Integrated Desk Top Computer with 12 inch Bit-Mapped Graphics or Character Display, 64Kb RAM, 4 MHz Z80A,® Two Quad Capacity Floppy Disk Drives, Selectric® Style 87 Key Keyboard, Business Graphics Software.

The North Star ADVANTAGE ™ is an interactive integrated graphics computer supplying the single user with a balanced set of Business-Data, Word, or Scientific-Data processing capabilities along with both character and graphics output. ADVANTAGE is fully supported by North Star's wide range of System and Application Software.

The ADVANTAGE contains a 4 MHz Z80A® CPU with 64Kb of 200 nsec Dynamic RAM (with parity) for program storage, a separate 20Kb 200 nsec RAM to drive the bit-mapped display, a 2Kb bootstrap PROM and an auxiliary Intel 8035 micro-processor to control the keyboard and floppy disks. The display can be operated as a 1920 (24 lines by 80 characters) character display or as a bit-mapped display (240 x 640 pixels), where each pixel is controlled by one bit in the 20Kb display RAM. The two integrated 5¼ inch floppy disks are double-sided, double-density providing storage of 360Kb per drive for a total of 720Kb. The n-key rollover Selectric style keyboard contains 49 standard typewriter keys, 9 symbol or control keys, a 14 key numeric/cursor control pad and 15 user programmable function keys.

G.W. COMPUTERS LTD, 01-636 8210 01-631 4818

☆ ☆ ☆ BUS ☆ ☆ ☆

(BUSINESS EFFICIENCY)

WIDELY USED IN U.K./FRANCE/U.S.A. AND ENGLISH SPEAKING COUNTRIES FOR ITS OVERALL FLEXIBILITY AS A COMPLETE BUSINESS PACKAGE

INCLUDES INVENTORY, DATABASE MANAGEMENT, INVOICING, MAILING ADDRESSES, STATEMENTS, SALES/PURCHASE LEDGER WITH OR WITHOUT AUTO STOCK UPDATE AND DOUBLE ENTRY JOURNALS INCLUDING NOMINAL LEDGER; PLUS A'C RECEIVABLE AND PAYABLE MAKING AUTO BANK ENTRIES.

01 = ADDRESS SECTION	10 = ORDER FILES	19 = NOMINAL ANALYSIS
02 = STOCK CONTROL	11 = 30/60/90 DAY AGE ANALYSIS	20 = AGED DEBTOR ANALYSIS
03 = A/C RECEIVABLES	12 = ARITHMETIC SECTION	21 = DISK DIRECTORIES
04 = SALES LEDGER	13 = PRINT CUSTOMER STATEMENTS	22 = FILE MANAGEMENT
05 = A/C PAYABLES	14 = PRINT SUPPLIER STATEMENTS	23 = SORTS
06 = PURCHASE LEDGERS	15 = PRINT AGENT STATEMENTS	24 = DISK SWAP/EXIT SYSTEM
07 = BANK UPDATE	16 = PRINT TAX STATEMENTS	WHICH OPTION . .
08 = USER DATABASE AREA	17 = RUN SEPARATE PROGRAMS	(LEVEL 8.00@875.00)
09 = INVOICE CREATION	18 = CHANGE VOCABULARY	

++++++++ SUPER — BUS ++++++++ A NEW HIGHER LEVEL OF THE ABOVE PACKAGE . . .
HAS BEEN REDUCED IN SIZE BY 50 PER CENT TO A SINGLE 15K BASIC PROGRAM, MAKING ALL FILE RETRIEVALS A MATTER OF NANOSECONDS. WORKS UNDER M/PM AND COMPUSTAR FOR COMMON DATA RETRIEVAL LEVEL 10.00..... **** 1475.00 ****

DBMS (DATABASE) HAS 01=; 02=; 04=; 06=; 07=; 08=; 17=; 18=; 21=; 24=. PRICE 475.00

DATABASE FEATURES ARE: . . . . FOR ANY SIZE RECORD UP TO TWENTY FOUR FIELDS FILE ARCHITECTURES CAN BE DESIGNED WITH COMPLETE FREEDOM OVER THE LINGUISTIC CONVENTIONS ASSIGNED TO EACH FIELD. THE FILE THEN CAN STORE 32000 RECORDS WHICH CAN BE SEARCHED BY THE RANDOM ACCESS NUMBER (RETRIEVED IN LESS THAN ONE SECOND) OR 'KEY' RANDOM ACCESS ON SPECIFIED FIELD OR SEQUENTIALLY COMPARING FOR LEFT FIELD PARTS, FIELD-INKEYS, OR PARTS OF RECORD, AND THEN CHANGED, PRINTED, DELETED, SKIPPED.

GRAMA (WINTER) LTD/G.W. COMPUTERS LTD. ARE THE PRODUCERS OF THIS PACKAGE WHICH IS UNEQUALLED FOR ITS LEVEL OF TOTAL INTEGRATION, LINGUISTIC FLEXIBILITY AND MAXIMISED DISK/MEMORY CONSERVATION.
AUTHOR TONY WINTER (M.D.; B.A.LIT; B.A.HON.PHIL; AND LECTURER)

G.W. COMPUTERS LTD, 01-636 8210 01-631 4818

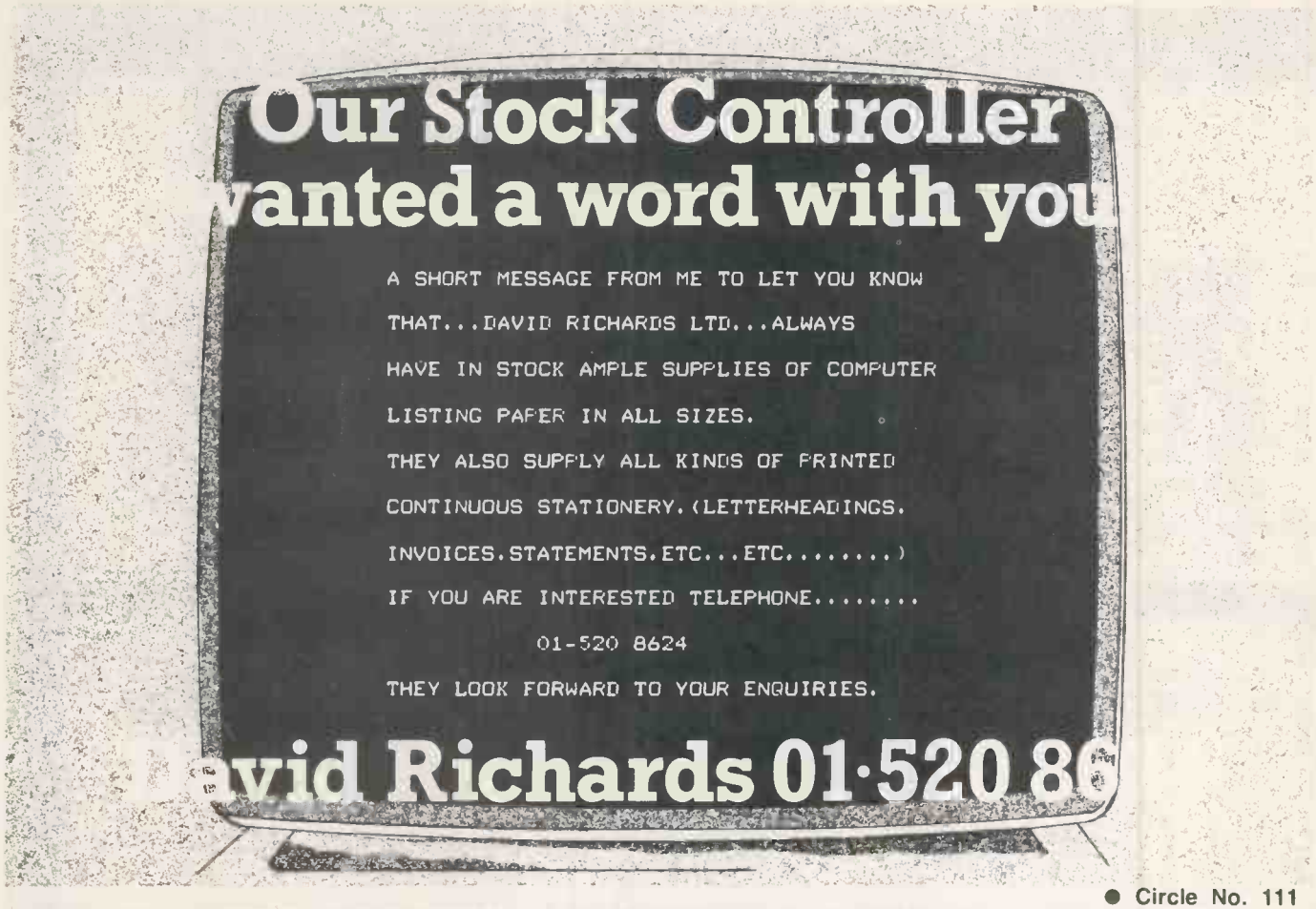
IMPORTANT!!!. NO HARDWARE IS ANY VALUE WITHOUT THE SOFTWARE, AND OUR SOFTWARE IS UNEQUALLED. WE GIVE YOU A DISCOUNT TO SET YOU GOING. JUST DECIDE ON THE SYSTEM YOU INTEND PURCHASING, AND TAKE 10% OF ITS VALUE OFF THE PRICE YOU WOULD HAVE TO PAY FOR THE SOFTWARE. YOU COULD GET THE SOFTWARE FREE WITH THE HARDWARE IF YOU CHOOSE THE BEST SYSTEM WE SELL.

SUPERBRAIN	CORVUS DSK	NORTH STAR	COMPUSTAR	PRINTER	PRINTER
64K + 320 K DISK	1995.00	64K MDL 10 VPU	1695.00	OKI MICRO-82A	575.00
64K + 700 K DISK	2495.00	64K MDL 15 PRNT	1595.00	OKI MICRO-83	795.00
64K + 1.5 M DISK	2995.00	64K MDL 20 VPU	2495.00	OKI MICRO-83A	850.00
64K + 6.3 M DISK	4595.00	64K MDL 30 VPU	2795.00	EPSON MX80FT	475.00
N'STAR & GRAPHICS	2395.00	64K MDL 40 VPU	2995.00	EPSON MX100	575.00
5.7 MG CORVUS DSK	2250.00	10 MEG INTERTEC	3250.00	TEXAS 810	1395.00
10 MEG CORVUS DSK	3250.00	BUS VER 8.00	875.00	NEC 5510	1695.00
20 MEG CORVUS DSK	4250.00	BUS MANUAL	25.00	NEC 5525	1895.00
CORVUS MULTIPLEX	695.00	DBMS2	575.00	QUME 9/45	1695.00
CORVUS MIRROR	695.00	N'STAR QD & CPM	2395.00	QUME 5/55	1950.00
ADVANTAGE N/STAR	2395.00	OKI MICRO 80	295.00	DRE 8830	1675.00
SYSTEM 1	**2395.00**	**SYSTEM 2**	**4595.00**	FORTRAN-80	200.00
64K+750 K DISK		64K+5.6 MEGABYTE CORVUS		PASCAL UCSD	475.00
CRT AND GRAPHICS CP/M		MICRO-WINCHESTER & CRT		SUPER SORT	120.00
IN 1 'N/STAR' UNIT		IN 1 'SUPERBRAIN' UNIT		BASCOMPILER 190.00	
		SYSTEM 3	**2950.00**	MAGIC CALC (CPM)	155.00
IF YOU WISH TO MAKE THE WARRANTY TO 1 YEAR		64K+1.5 MEG		BUS VER 8.00	975.00
THEN ADD 5% OF HARDWARE COST. OTHERWISE		CRT AND TWIN 5"		LETTERIGHT	100.00
NO MAINTENANCE SCHEDULE, SIMPLY ADD-HOC		IN COMPUSTAR UNIT		COBOL-80	320.00
CHARGES AFTER WARRANTY EXPIRATION, SAME		MBASIC 80	150.00	WORD-STAR	250.00
QUALITY SERVICE. (SITE MAINTENANCE ON		CIS COBOL	420.00	CBASIC	75.00
APPLICATION).		MAIL MERGE	55.00	MAGIC WAND	190.00
MAIL ADDRESS: G. W. COMPUTERS LTD, 55		DATASTAR	190.00	T/MAKER	150.00
BEDFORD COURT MANSIONS, BEDFORD		DBMS (DATABASE)	475.00	BUS VER 9.00	975.00
AVENUE, LONDON WC1. TELEX 892031 TWC G		DBMS (EXTENDED)	575.00	UTILITIES	75.00
. . . . . BOSTON OFFICE TELEX 94-0890.		MSORT & DSORT	75.00		

DUE TO LONG TERM CONTRACTUAL COMMITMENTS, WE ARE ONLY GIVING RESTRICTED DEMONSTRATIONS BY APPOINTMENT AT ONE OF OUR LONDON OFFICES. WE EXPORT TO ALL COUNTRIES.
CONTACT TONY WINTER ON 01-636 8210 OR 01-631 4818 AND IF UNAVAILABLE THEN LEAVE A CALL-BACK MESSAGE (CLEARLY STATING YOUR TELEPHONE NUMBER AND NAME) ON THE 24 HOUR ANSWER-PHONE, WE CALL BACK ANYWHERE IN THE WORLD.
OR SIMPLY LEAVE YOUR ADDRESS AND WE'LL MAIL YOU A STANDARD INFORMATION PACK. MAIL ADDRESS: 55 BEDFORD COURT MANSIONS, BEDFORD AVENUE, LONDON WC1.

**CALL ONLY BY APPOINTMENT AT 55 BEDFORD COURT MANSIONS,
BEDFORD AVENUE, LONDON W.C.1. TELEX 892031 TWC G**

● **Circle No. 110**



● Circle No. 111

apple®

START THE RIGHT WAY WITH THIS CONFIGURATION AT A VERY COMPETITIVE PRICE, WITH A YEAR'S PARTS AND LABOUR WARRANTY

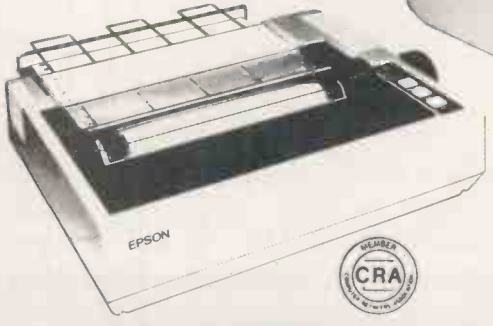
THE SYSTEM

APPLE II EUROPLUS 48K
DISK DRIVE WITH CONTROLLER
DISK DRIVE WITHOUT CONTROLLER
12" GREEN MONITOR
EPSON MX80T PRINTER & INTERFACE
VISICALC 3.3

OUR PRICE

MARCHESSA LIMITED

MARCH/APRIL	
NETT	£1,995.00
VAT	£229.22
TOTAL	£2,294.25 + delivery



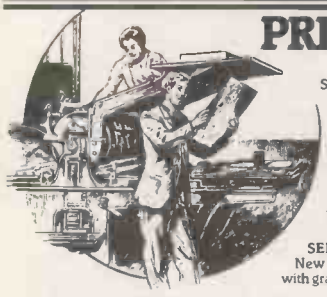
RING US FOR DETAILS OF ALL APPLE PRODUCTS

6 FOSTER LANE,
LONDON EC2V 6HH.
TEL: 726 4800/3/9

● Circle No. 112

New-fangled hardware old-fashioned value at NSC Computer Shops!!!

PRINTERS



SEIKOSHA GP80A
Cheapest dot matrix printer. Recommended by Acorn and Commodore.
New low price. £179.00

SEIKOSHA GP100A
Wider version of GP80A £199.00

SEIKOSHA 8510
New friction/tractor printer with graphics £475.00

OKI MICROLINE 80 Low cost, 80 column, upper/lower case with pin and friction feed. £275.00

OKI MICROLINE 82 Bi-directional printing, programmable form length, serial and parallel. £399.00

OKI MICROLINE 83
120 cps bi-directional on 15 inch paper. £759.00

SERIAL INTERFACE
RS-232 interface for M 80 £105.00

HI-SPEED INTERFACE
High Speed RS-232 interface for M 80/82 £185.00

TRACTOR Tractor for M 80/82 £55.00

TYMAC INTERFACE
Apple Interface and cable for M 80 series £89.00

EPSON MX 80 80 column tractor fed printer £358.00

EPSON MX 80FT
As MX 80 but with friction and tractor £399.00

EPSON MX 80FT II
As MX 80FT but with hi-res dot graphics £449.00

EPSON MX 82 Friction and tractor feed £399.00

EPSON MX 82FT
Graphics, friction and tractor feed £449.00

EPSON MX 100
As MX 80FT but with full 15 inch platen £575.00

APPLE INTERFACE
Apple interface and cable for MX series £89.00

SERIAL INTERFACE
Serial interface and RS-232 cable for MX £59.00

BUFFERED INT. As above with 2K buffer £79.00

RIBBONS Ribbons MX 80/82 £9.00

RIBBONS Ribbons MX 100 £13.00

CENTRONICS 737-2
Letter quality printing – parallel version £425.00

CENTRONICS 737-4 Serial version £475.00

CENTRONICS 737P Pet version £485.00

CENTRONICS 739-2
As 737-2 but with high res graphics £495.00

CENTRONICS 739-4 Serial version £544.00

CENTRONICS 150-2
150 cps, bi-directional, logic seeking £499.00

CENTRONICS 150-4 Serial version £544.00

CENTRONICS 779
Due to a bulk purchase, NSC are able to offer you this DP quality, upper case only printer with infinitely variable print size (10 to 16.5 cpi) and full logic seeking head at less than half the normal trade price £295.00

INTEGREX CX80
Full colour printer for Apple, VIC etc. £895.00

COLOUR INTERFACE
Apple colour dump card for above £125.00

RIBBONS Tricolour ribbons for above £5.00

QUANTEX 6000 150 cps matrix printer £875.00

ANADEX DP 9500L
150 cps, 15 inch platen, serial and parallel £895.00

ANADEX DP9501
As DP9500 with graphics and other features £1045.00

RIBBONS Ribbons for Anadex DP9000 series £14.00

TEXAS 820 RO
High quality for 150 cps programmable printer £1300.00

OLYMPIA EK100KSR A typewriter and letter quality printer all in one package at the amazing price of £995.00

DIABLO 630 RO High quality daisy wheel printer capable of using metal or plastic daisy wheels P.O.A.

B.D.T. Cut sheet feeder for Diablo and other daisy wheel printers from £650.00

FUJITSU SP830
80 cps daisy wheel – the fastest around! £1995.00

On all printers please add £6.00 for carriage.
All other items please add 50p for p&p.

COMPUTERS

ACORN ATOM
Available ex stock in any configuration – 8K+2K kit or assembled in any size up to 12K+12K. New ROM enables compatibility with BBC machine.
PRICES INCLUDING VAT & P&P
8K+2K Kit £140.00 8K+2K Assembled £174.50
Colour Atom inc PSU £204.00
12K+12K Assembled £289.50 Power Supply £10.20

VIC 20
Fast becoming the most popular home computer. Price including VAT £189.95 (p&p £3.00 extra).

PET
Britain's best known micro computer. Our prices start from £375.00

APPLE II
Our best selling medium priced computer. Start with the basic unit and build up your system with disk drives, Pascal system, graphics tablet, voice recognition card, Visicalc, etc. Phone for our latest prices on all these items.

APPLE III
128K computer + Monitor III and Apple III Software comprising Business BASIC, Sophisticated Operating System (SOS) and Apple II emulation. £2545.00.

COMART COMMUNICATOR
4MHz, Z80A, S100 Computer with choice of twin 170K, 390K or 720K floppy disk drives or one floppy and one 5Mb Winchester hard disk. Also available 20Mb hard disk which can be added to any of the above. This computer has been designed with communications in mind and we can offer an interface to Prestel as well as the usual accounting packages. Prices start at £1750.00.

NORTH STAR
Come and see the Advantage, a major new system from a well established manufacturer. £2195.00. We can also supply the Evergreen Horizon.

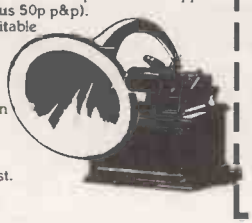
RAIR (THE ICL PERSONAL COMPUTER)
The D.P. Manager's favourite micro. The 3/20 machine has twin 250K floppy disk drives and the 3/30 has one floppy and one 5Mb Winchester hard disk. Also available is a 10Mb hard disk drive which can be added at the time of purchase or at a later date. M/PM for multi user environments. Programming languages available include basic Fortran, Pascal, Cobol and Assembler. Prices start from £2,750 and rental terms are available.

CROMEMCO
If you're looking for a 'Unix' like operating system, look no further. Cromemco's Cromix offers you up to 63K memory space per user with the ability to run C/PM programmes if required. Choose from System zero, one, two, three or Z-2H.

If you are looking for a VDU to complement your system, NSC can supply any one from a variety of manufacturers at prices ranging from £400 – £2,500.
LEAR SIEGLER, TELEVIDEO, VOLKER CRAIG, BEEHIVE, DEC, IBM.

FLOPPY DISCS

Most manufacturers now recommend Dysan floppy disks with their computers. We stock Dysan at the following prices: S/Sided S/Density suitable for Apple etc. £25.00 per 10 **(plus 50p p&p).**
D/Sided D/Density suitable for Rair, Cromemco, Comart, North Star £40.00 per 10 **(plus 50p p&p)**
We recommend Dysan floppy disks to all our customers. Other brands and sizes are available upon request.



BOOKS
+FANFOLD PAPER
Readily available in a variety of widths. C12 Cassettes, Printer Ribbons and most computer accessories

12" BLACK AND WHITE TV MONITOR

By adapting 12" TV sets to accept composite video input we are able to bring you 12" black and white monitors at a saving of almost 100% over competitive equipment. Price including a cable to your Apple, or similar, only
£99.95
(plus £6.00 carriage).

NSC are a BBC Micro Computer dealer, come in, see and buy your computer peripherals.

ORDER BY POST WITH CONFIDENCE
Instead of calling personally at NSC Computer Shops you can send cash with order. Please complete the order form below.
All prices are exclusive of VAT except where otherwise stated. Prices correct at time of going to press.

NSC COMPUTER SHOPS

NSC Computer Shops, 29 Hanging Ditch, Manchester M4 3ES. Tel: 061-832 2269

Please send the following order:

NAME _____

ADDRESS _____

_____

_____ POSTCODE _____

	PRICE
P&P	
TOTAL	

Most of our prices are heavily discounted and therefore payment must accompany the order. Credit card payments will be accepted. Please quote credit card number and type of card. Cheques payable to NSC Computer Shops.

I wish to pay by Access*/Barclaycard*/Diners Card* (*delete as applicable).
CARD NO.

DATE _____

SIGNATURE _____

NSC Computer Shops, 29 Hanging Ditch, Manchester M4 3ES.
Tel: 061-832 2269

PC 3/82

● Circle No. 113

SYSTEM 4000
EPROM EMULATOR/PROGRAMMERS

EX-STOCK

P4000 PRODUCTION EPROM PROGRAMMER

This unit provides 'simple, reliable' programming of up to 8 EPROMs. It has been designed for ease of operator use — a single 'program' key starts the blank check — program — verify sequence. Independent blank check and verify controls are provided along with mode, pass/fail indicators for each copy socket and a sounder to signal a correct key command and the end of a programming run. Any of the 2704/2708/2716 (3 rail) and 2508 / 2758 / 2516 / 2716 / 2532 / 2732 EPROMs may be selected without hardware or personality card changes.
2 year warranty. Price **£545 + VAT: + £12.00 DELIVERY**

VM10 VIDEO MONITOR

This compact, lightweight Video Monitor gives a clean crisp picture on its 10" screen. Suitable for use with the EP4000, SOFTY and other systems. 12 month warranty. Price **£88 + VAT, carriage paid.**

EP4000 EPROM EMULATOR/ PROGRAMMER

The microprocessor based EP4000 has been designed as a flexible, low cost, high quality unit for emulating and programming all the popular NMOS EPROMs without the need for personality cards, modules or hardware changes. Its software intensive design permits selection of the 2704 / 2708 / 2716 triple rail EPROMs and the 2508 / 2758 / 2516 / 2716 / 2532 / 2732 single rail EPROMs for both the programming and emulating modes.
The video output (T.V. or monitor) for memory map display in addition to the built-in Hex LED display, for stand alone use, is unique in this type of system. This, with the double function 28 key keypad, powerful editing features, powered down programming socket, buffered tri-state simulator cable and 4k x 8 data RAM gives you the most comprehensive, flexible and compact systems available today.
2 year warranty. Price **£545 + VAT: + £12 DELIVERY**

MODEL 14 EPROM ERASERS

MODEL UV140 EPROM ERASER

Similar to model UV141 but with out timer. Low price at **£61.50 + VAT, postage paid.**

MODEL UV141 EPROM ERASER EX-STOCK

- 14 EPROM capacity
- Fast erase time
- Built-in 5-50 minute timer
- Safety interlocked to prevent eye and skin damage
- Convenient slide-tray loading of devices
- Available Ex-Stock at **£78 + VAT** Postage Paid

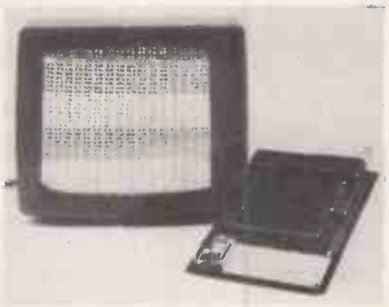
DISTRIBUTORS REQUIRED — EXPORT ENQUIRIES WELCOME

GP INDUSTRIAL ELECTRONICS LTD,

UNIT E, HUXLEY CLOSE, NEWNHAM INDUSTRIAL ESTATE, PLYMOUTH, DEVON PL7 4JN
TELEPHONE: PLYMOUTH (0752) 332961 (Sales) / 332962 (Technical Service).

SOFTY SYSTEMS

EX-STOCK



SOFTY 2
LOW COST 2716 EMULATOR/PROGRAMMER

● Direct output to T.V. ● High speed cassette interface ● On card EPROM Programmer ● Multifunction touch keypad ● 2K Monitor in 2716 ● 2K RAM ● 128 byte scratchpad RAM ● 2K EPROM Emulation ● Can program 2732/2532 in two halves ● Editing facilities including — Data entry/deletion, Block shift, Block store, Match byte, Displacement calculation ● Supplied with ZIF socket, Simulator cable, comprehensive manual, Antistatic lined EPROM tray and PSU. SOFTY 2 **£169 + VAT** (includes p&p)

SOFTY 1
LOW COST 2704/2708 EMULATOR/PROGRAMMER

● Direct output to T.V. ● High speed cassette interface — On card EPROM Programmer ● Multifunction keypad ● 1K Monitor in 2708 ● 1K RAM ● 128 byte scratchpad RAM ● 1K EPROM Emulation ● Comprehensive editing facilities ● Supplied with ZIF socket, Simulator cable and comprehensive manual.
SOFTY 1 (Built and tested) **£120 + VAT**
SOFTY 1 Power Supply **£20 + VAT**

SOFTY 1
CONVERSION CARD

Enables SOFTY to program the single rail EPROMs, 2508 / 2758 / 2516 / 2532. Selection of device type and 1K block are by pcb slide switches. ZIF Programming socket. Supplied built and tested. **£40 + VAT.**

EX-STOCK EPROMS

	1-24	25-99	100 up
2732	6:50	5:75	4:95
2716	2:80	2:60	2:40
2708	2:80	2:60	2:40

ADD VAT AT 15% – POSTAGE PAID

WRITE OR TELEPHONE FOR DETAILS ON ANY OF OUR PRODUCTS

● **Circle No. 114**

The programme guide

Stock control, order processing, invoicing, statement production, payroll, general accounting . . . these are most of the jobs that a business will tackle every day. GRAFFCOM's Integrated Small Business Software packages – ISBS are designed to get these jobs done better and faster. ISBS can improve your productivity and give you better management control over your business.

For the smaller business user with a twin floppy disk based system, ISBS-F is the ideal starting point. A truly integrated accounting approach, the system offers simplicity of use without trade-offs in facilities. In fact most of the ISBS-F features can be found in mini and mainframe systems.

Companies with large data volumes and multiuser requirements should look at ISBS-W. The system supports multiple workstations and Is designed to take full advantage of the latest hard disk storage based systems. As you would expect, ISBS-F users can easily convert to ISBS-W when the business expands through the System Migration Plan – SMP.

GRAFFCOM's software products have been designed for most CP/M, MP/M based microcomputer systems. All packages are supplied with comprehensive documentation and backed up with technical support, and maintenance to cover legislative changes. In addition there are products such as accounting guides and graphics programs available to complement and complete our service to the commercial user.

So whether you need professional application software to use or sell, then call us now for further details. (Computer suppliers should ask for information about our Dealer and Superdealer arrangements).

GRAFFCOM SYSTEMS GROUP

102 Portland Road London W11 4LX 01-727 5561

GRAFFCOM

ISBS-W

A totally integrated suite of software designed for microcomputers which use Hard disks or Winchester disks. The user can choose from any combination of modules and add others at a later stage if required.

1.0 Business Controller

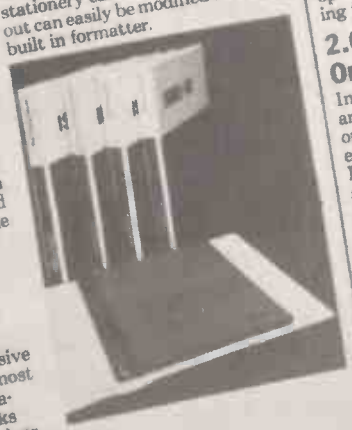
The business control module acts as a task manager and supervisor for all users and mainfile updates. Operators will feel at ease with the menu prompting when selecting tasks such as order processing, invoicing, accounting modules and word processing. The controller is used to set the system parameters, typically the number of disk units and sizes, number of printers, password and authorization codes. You can develop your own application modules for those special jobs and have them incorporated in the business control menu.

2.0 Accounting

The system offers a comprehensive range of facilities to meet the most demanding accounting applications. The modules cover tasks such as sales and purchase ledger, payroll and nominal ledger. Management reports including the P/L and Balance sheet can be produced from the data captured by the system. Audit trails are produced for all transactions entered, with batch totals where applicable. In addition to the main accounting reports, pre-printed output includes statements, cheques and remittances, and also payslips and bank giros.

3.0 Stock & Order Processing

Stock levels can be checked quickly using the on-line enquiry module, and the operator can also allocate stock if required. Order processing allows orders to be entered and maintained 'until all items and quantities have been shipped. Invoices and order acknowledgements can be produced on line if required with automatic release of stock and drawdown from the orders file. Pre-printed invoice stationery can be used and the layout can easily be modified using the built in formatter.



4.0 Word Processing

To complete the suite, the word processing module offers one of the most sophisticated systems found on today's microcomputers. It includes all the standard features that you would expect to find in a WP system, such as tabs, justification, margins, global search and replace, proportional spacing etc. In addition there is a merge document option to produce those personalised mailshots and labels, and also a built in spelling checker with a 10,000 word (expandable) dictionary.

ISBS-F

ISBS-F is a comprehensive system designed for first time users of floppy disk systems. It can be fully integrated or each module can be used individually, adding others at a later date, which makes it an ideal choice for the first time user.

1.0 Stock Control

The programme allows fast interrogation of any stock line and produces 11 comprehensive reports to achieve optimum stockholding. Amongst the many features, including stock updates, release and goods inwards, the system has the option to define stock groups allowing for parts explosion.

2.0 Order Entry & Invoicing

Invoices can be produced quickly and easily, either by referring to an order already entered, or by entering data at the invoice stage. If necessary, part orders can be sent, as the system can keep track of each order until it is completed. Release of stock and posting of invoices to the Company Sales System is carried out automatically.

3.0 Company Sales System

Customers can be set up as open item or balance forward accounts, and statements can be produced easily at anytime. An online enquiry and comprehensive credit control reports allow you to monitor customer credit limits and help maintain a healthy cash flow. The system can handle part payments and unallocated cash, and produces a full audit trail of payments received.

4.0 Company Purchases System

Target payment dates can be assigned to each supplier invoice, to plan cash flow and to help speed payment procedure. There are reports to show ageing of invoices and the system also has the facility to print cheques on preprinted stationery or payment advices on Company letterheads.

5.0 General Accounting System

The main feature on this programme is the flexibility of the cost code system, which allows you to design final Company reports such as the Profit and Loss Account and Balance sheet. Comprehensive budget reports can be produced, showing any variances between budget and expenditure for your own chosen accounting period.

6.0 Payroll

Employees can be paid by cheque, cash or bank giro transfer, on a weekly, monthly or hourly basis, depending on the Company requirements. The system is fully maintained and incorporates all new legislation. Some of the facilities include overtime, holiday pay, coin analysis reports, and production of P11/P60 forms at year end.

7.0 Names and Addresses

Names and addresses of customers and suppliers together with any others you may wish to keep a record of, can be stored centrally in this system. Names are retrieved by the programmes for completion of invoices, statements etc., by use of an id code unique to each name. A report generator allows you to design and store your own reports.

NEWS RELEASE

LATEST SYSTEMS FOR ISBS-F

IBM Personal Computer

Xerox 820

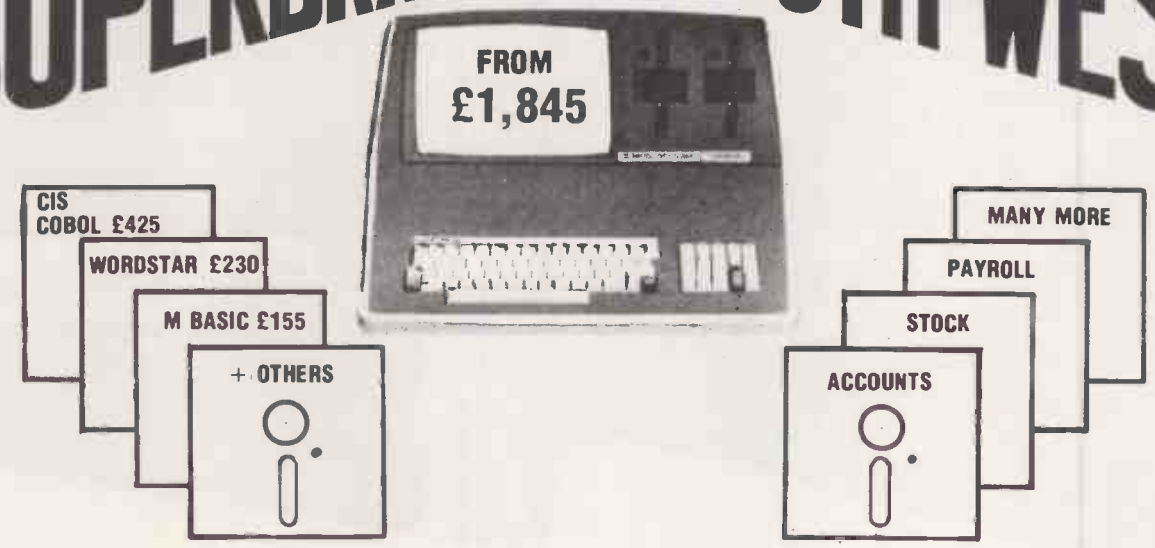
NEC PC 8000

Hewlett Packard HP 125

● Circle No. 115

23

SUPERBRAIN IN THE SOUTH-WEST



TOTALLY INTEGRATED MSL ACCOUNTS SYSTEM

PROFESSIONAL SERVICE & SUPPORT

FOR QUOTATIONS OR FURTHER DETAILS CONTACT

EASTFERN LIMITED

19 ALEXANDRA PARADE WESTON-SUPER-MARE AVON TEL: 0934-418346

● Circle No. 116

VIDEOTEX '82 SYSTEMS

CONFERENCE & EXHIBITION

CUNARD INTERNATIONAL HOTEL, LONDON MAY 5-7 1982

Videotex Systems '82 provides the ideal opportunity for manufacturers and suppliers of specialist services to display their products and demonstrate their expertise within the field of private videotex systems. The event is the second in this unique series of annual conferences and exhibitions, which are entirely dedicated to this new area of information technology.

The exhibition, which will be run in parallel with a major conference, organised on behalf of The Association of Viewdata Information Providers (AVIP), is designed to promote a business-like atmosphere, conducive to the practical discussion of technical and business matters. In addition to the conference, there will be a series of workshops, at which exhibitors will be able to make detailed presentations of their products.

Set in the comfortable surroundings of the Cunard Hotel, London, the event and venue gives every facility to the discerning businessman. Sponsored by Viewdata & TV User and organised by IPC Exhibitions Ltd, the event has the full backing of IPC Business Press, the world's largest publishers of specialist and business journals. Utilising these resources, a comprehensive publicity campaign is sure to attract the highest quality visitors to the event.

Be sure of your participation in this important event, fill in and return this coupon now!

VIDEOTEX '82 SYSTEMS
CONFERENCE & EXHIBITION

Return to The Sales Manager, Videotex Systems '82, IPC Viewdata Ltd, Room 1203, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS or telephone 01-661 3500.

I am interested in receiving more details on The Exhibition

NAME _____

COMPANY _____

ADDRESS _____

● Circle No. 117

THINKING ABOUT BUYING A COMPUTER SYSTEM?

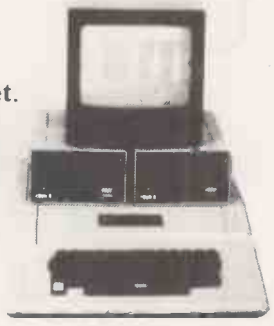
TALK TO DATALECT FIRST!

COMMODORE®

No. 1 best seller in the U.K. Tackles your bookeeping, stock control and word processing. This system is reliable and superb value.

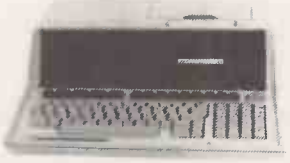
APPLE®

One of the most versatile on the market. Expandability up to 48 kbytes of user memory, supported by a large range of programs and peripherals.



HEWLETT PACKARD®

A portable (only 20 lbs) specialist computer with a fully integrated key board, display and printer.



®ACT 800 series

A large microcomputer system supported by an excellent range of programs. Expandable to multitasking up to 20 meg.

® Registered trademarks of Commodore, Apple Inc., Hewlett Packard, ACT.

...because who else provides all this–at a price you can afford

We offer you a choice of these budget priced, easy to operate microcomputers. Starting in price from an amazing £200 for a computer, £1,500 for a complete system. All come with a versatile range of programs to meet todays modern business needs.

Try one out for yourself

If you're not sure how a microcomputer can help, call in at our WOKING or CROYDON SHOWROOMS.

Keeping you going

Fast reliable SERVICE if you're based in London and the South.

Buying your system

Attractive terms, leasing and the best deals available in London and the South.

Remember, when you buy from Datalect you're getting 10 yrs EXPERTISE, SERVICE, ADVICE and TRAINING and the best after-sales care.

SHOWROOMS:
CROYDON. 7, St.Georges Walk, Croydon, Surrey.
Tel: 01-680 3581
WOKING. 32, Chertsey Road, Woking, Surrey.
Tel: 04862 63901

THE BEST PRICES AND THE BEST SERVICE IN THE SOUTH

DATALECT
COMPUTERS

Your computer company for London and the South

Please send me details and price list.

Name _____

Company _____

Position _____

Address _____

_____

_____ Post Code _____

DATALECT Computers.
Dept.PC , 33/35 Portugal Rd., Woking, Surrey GU21 5JF

● Circle No. 118

CUMANA promise you absolutely reliable and compatible

FLOPPY DISK DRIVES

40 and 80 TRACK CASED UNITS

Dual Disk Units

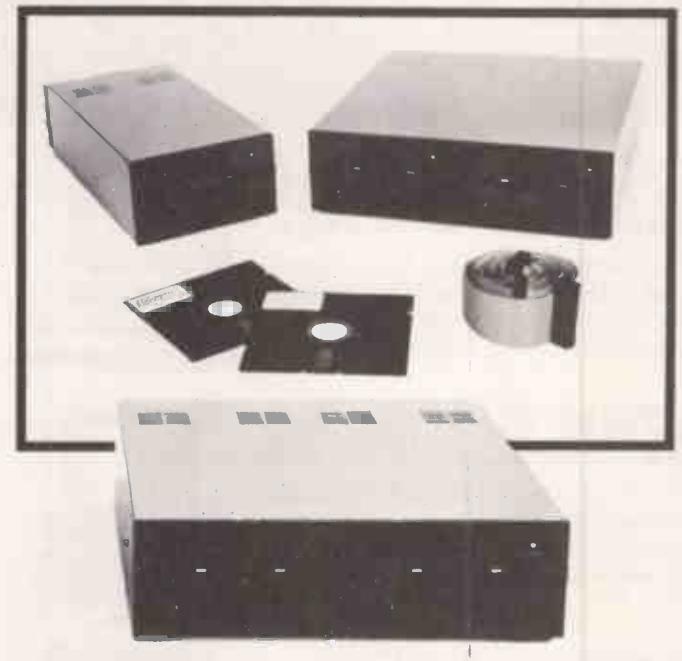
2 x 40 Track single sided Drives	£399
2 x 80 Track single sided Drives	£539
2 x 80 Track double sided Drives	£799

Single Disk Units

1 x 40 Track single sided Drive	£219
1 x 80 Track single sided Drive	£285
1 x 80 Track double sided Drive	£429

Disk Drive Cables

2 Drive Cable	£15.00
4 Drive Cable	£25.00



Cumana Ltd., offer you a dependable flow of exceptionally high quality **DISK DRIVES** from **TEAC** of Tokyo featuring high reliability and compatibility. **Cumana** have an enviable reputation and aim to continue giving you the best service in the business. These main powered Disk Drive units are designed to interface to a wide range of computers such as **Genie I and II, SWTP, Heathkit, Superbrain, Nascom, Atom** and the **BBC Micro.**

Write or 'phone for Data Sheets

Call your nearest dealer for a demonstration:

RADIO SHACK LTD., 188, Broadhurst Gardens, London NW6. Tel: 01-624-7174

COMPSHOP LTD., 14, Station Road, New Barnet, Herts. Tel: 01-441-2922

COMPSHOP LTD., 311, Edgware Road, London W2. Tel: 01-262-0387

COMPSHOP LTD., 19, Herbert Street, Dublin 2. Tel: 604165

LONDON COMPUTER CENTRE, 43, Grafton Way, London W1. Tel: 01-388-5721

N.L.C. 61, Broad Lane, London N15. Tel: 01-808-0377

CROYDON COMPUTER CENTRE, 29a, Brigstock Road, Thornton Heath, Surrey. Tel: 01-689-1280

P J EQUIPMENT LTD., 3, Bridge Street, Guildford. Tel: 0483-504801

R.D.S. ELECTRICAL LTD., 157-161, Kingston Road, Portsmouth. Tel: 0705-812478

TANDY HASTINGS LTD., 48, Queens Road, Hastings. Tel: 0424-431849

MICROWARE COMPUTING SERVICES, 57, Queen Charlotte Street, Bristol. Tel: 0272-279560

BLANDFORD COMPUTERS, Higher Shaftsbury Road, Blandford Forum. Tel: 0258-53737

TAPE SHOP 32i Viaduct Road, Brighton. Tel: 0273-609099

PARWEST LTD., 18, St. Mary Street, Chippenham. Tel: 0249-2131

COMPUTER SHACK 14, Pittville Street, Cheltenham. Tel: 0242-584343

TANDY GLOUCESTER, 13, Clarence Street, Gloucester, Tel: 0452-31323

COMSERVE, 98, Tavistock Street, Bedford. Tel: 0234-216749

CLEARTONE COMPUTERS, Prince of Wales Ind. Estate, Abercarn, Gwent. Tel: 0495-244555

EMPRISE LTD., 58, East Street, Colchester. Tel: 0206-865926

MAGNUS MICRO-COMPUTERS, 139 The Moors, Kidlington, Oxford. Tel: 08675-6703

CAMBRIDGE COMPUTER STORE, 1, Emmanuel Street, Cambridge. Tel: 0223-65334

I.C. ELECTRONICS, Flagstones, Stede Quarter, Biddenden, Kent. Tel: 0580-291816

MICRO CHIP SHOP, 190, Lord Street, Fleetwood, Lancs Tel: 03917-79511

HARDEN MICRO-SYSTEMS, 28-30, Back Lord Street, Blackpool. Tel: 0253-27590

AMBASSADOR BUSINESS COMPUTERS LTD., Ashley Lane Works, Shipley, W. Yorks. Tel: 0274-595941

Q-TEK SYSTEMS LTD., 2 Daltry Close, Old Town, Stevenage, Herts. Tel: 0438-65385

COMPUTER & CHIPS, Feddinch Mains House, St. Andrews, Fife, Scotland. Tel: 0334-72569

HEWART MICRO-ELECTRONICS, 95, Blakelow Road, Macclesfield. Tel: 0625-22030

KARADAWN LTD., 2 Forest Way, Great Sankey, Warrington. Tel: 0925-572668

PHOTO-ELECTRICS, 459 London Road, Sheffield. Tel: 0742 53865

ARC ELECTRONICS, 54 Heron Drive, Sandal, Nr. Wakefield, W. Yorks WF2 6SL. Tel: 0924-253145

VICTOR MORRIS LTD., 340 Argyle Street, Glasgow, G2 8LY. Tel: 041-221 8958

COMPRITE LTD., Thorite House, Laisterdyke, Bradford. Tel: 0274-663471

GNOMIC LTD., 46, Middle Street, Blackhall, Hartlepool. Tel: 0783-863871

BRIERS COMPUTER SERVICES, 1, King Edward Square, Middlesbrough, Cleveland. Tel: 0642-242017

3 LINE COMPUTING 36, Clough Road, Hull. Tel: 0482-445496

H.C. COMPUTER SALES LTD., 182, Earlsway, Team Valley Trading Estate, Gateshead. Tel: 0632-874811

EWL COMPUTERS LTD., 8, Royal Crescent, Glasgow. Tel: 041-332-7642

EVERYMAN COMPUTING, 14 Edward Street, Westbury, Wilts. Tel: 0373-864644

CUMANA LTD 35 Walnut Tree Close, Guildford, Surrey, GU1 4UN. Telephone: (0483) 503121. Telex: 858306

Please add VAT to all prices. Delivery at cost will be advised at time of order.

Master Your Micro FAST with...

Little Genius floppy diskette based courses will teach you, how to use your system and how to realise the full potential of the "Mighty Micro". These fully interactive computer lessons will guide you quickly to a high level of understanding and confidence in your ability to make the most of your microcomputer system.

NOW PASCAL!

Courses now available:

- *Applesoft BASIC*
- *Advanced Applesoft BASIC*
- *Using your Apple*
- *PET BASIC*
- *Advanced PET BASIC*
- *Using your PET*
- *Beginners Pascal*
- *Advanced Pascal Using Pascal*
- *380Z BASIC*
- *Advanced 380Z BASIC*
- *Using your 380Z*

Little Genius

Each course, comprising a floppy diskette, and starting instructions, costs only £40.00 plus VAT.

SPECIAL "3 in one" OFFER for 3 courses covering the same system only £99.00 plus VAT.

Little Genius courses are available from most computer retail outlets, or direct mail order from:

LITTLE GENIUS
Suite 504, Albany House, 324 Regent Street, London W1R 5AA.
Telephone: 01-580 6361 ● **Circle No. 120**

If that Apple is just out of Reach....

Rent One!

If you have a short term requirement for a microcomputer system for evaluation, training or just hands-on experience — come to Atlanta!

Apart from Apples we have top quality printers, monitors, disk drives and a huge range of software including VisiCalc, Visidex, Wordstar, Format-80, Magic Window, Micromodeller, APM, CIS COBOL and all accounting programs.

A complete system can be working for you within a few days of your enquiry with *no* capital expenditure!

Rental Hotline
01-729 1411/2

Atlanta Data Systems
350/356 Old Street, London, EC1V 9DT. **01-739 5889**

● **Circle No. 121**

Get more out of your ZX81!

the March issue of

YOUR COMPUTER

looks at the growing range of memory expanders for the ZX81 and explains how they enhance the power of your basic unit.

Also for ZX81 owners: how to generate music on your computer. Yes, it can be done!

Other articles in this issue include:

- Part II of our chess computer survey. This examines the powerful SciSys Chess Champion Mk V together with other new machines and programs.
- Reviews of the Nascom I, II and III and the latest products released by Lucas Logic.

All this, PLUS our regular calculator page, advice column and pages of program listings and games for the Atom, Pet and Videogenie.

At all leading newsagents. Price 60p.

Why not put in a regular order to avoid disappointment? Or take out a subscription by filling in the coupon.

To:
Marketing Department, Room 316
IPC Electrical Electronic Press
Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS

Please send me 12 issues of Your Computer
I enclose cheque/PO for £8 UK/£14 Overseas, payable to IPC Business Press Ltd.

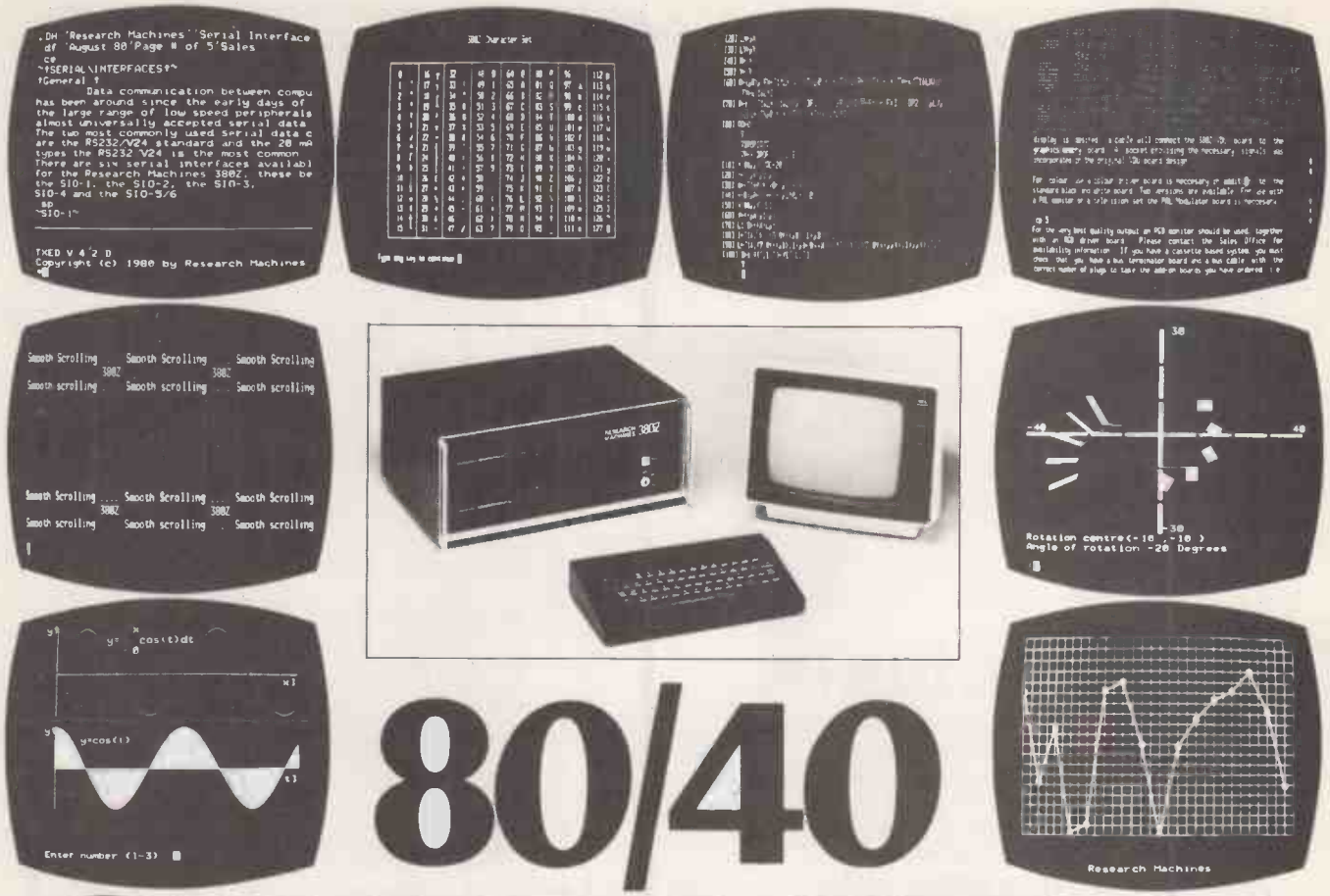
NAME _____

ADDRESS _____

_____

_____

PC



80/40 CHARACTER MACHINE

Providing exactly the right facilities for different applications can be a real problem when a system is as versatile as the 380Z.

Take, for example, screen line length. Not only do different users have different needs; so too do individual users.

They might welcome forty character clarity for presentation, display, and control applications; but they also want eighty character capacity, because word processing, some programming languages, and many general-purpose applications demand it.

So we've developed Varitext — to provide both, on the same machine.

Varitext means that the 380Z user can always choose the line length best suited to the application. It gives access to a growing range of 80 character software without losing all those well-established and popular 40 character applications. It makes the 380Z equally effective as a computer and a word processor. It lets programmers use the character mode with which they are familiar – or which languages like ALGOL, FORTRAN, and PASCAL really need.

And it improves the quality of our already exceptional graphics, by offering a smaller character size for neater annotation.

But the Varitext option goes a great deal further than that. We also saw it as the opportunity for a major enhancement of the 380Z's screen handling capabilities. So we added:

- ☐ ***an 8 × 10 dot matrix, to further refine the character set;***
- ☐ ***an additional set of 128 user-definable characters;***
- ☐ ***reverse video, underlining, and selective character dimming;***
- ☐ ***smooth scrolling and faster screen filling;***
- ☐ ***user defined windowing (and independent scrolling) of screen areas;***
- ☐ ***audible tone generation (option)***

And all that, we believe, makes the 380Z's screen handling the best on the market.

The Varitext option is available with new systems or as a user-installable enhancement to existing 380Z systems. Contact our Sales Office for details.

RESEARCH MACHINES
MICROCOMPUTER SYSTEMS

RESEARCH MACHINES LTD Mill Street, Oxford OX2 0BW, Tel: (0865) 49866

● **Circle No. 122**

HAYDEN BOOKS

New and Recent Titles:

THE BASIC CONVERSIONS HANDBOOK FOR APPLE™, TRS-80™, and PET™ USERS

The Brain Bank (David A. Brain, Philip R. Oviate, Paul J.A. Paquin, and Chandler D. Stone, Jr.)

Now you can convert a BASIC program for the TRS-80, Apple II, or PET to the form of BASIC used by any other one of those machines. This is a complete guide to converting Apple II and PET programs to TRS-80, TRS-80 and PET programs to Apple II, and TRS-80 and Apple II programs to PET. Equivalent commands are listed for TRS-80 BASIC (Model I, Level II), Applesoft BASIC and PET BASIC, as well as variations for the TRS-80 Model III and Apple Integer BASIC. Also described are variations in graphics capabilities, PEEK, POKE, and CALL statements, cursor and control characters, memory locations, etc.
In addition to a complete listing of equivalent commands, the book contains helpful advice on the methodology of converting programs, explanations of machine peculiarities, and detailed explanations of Applesoft commands. Appendices provide useful subroutines, sample programs, and charts showing screen coordinate conversion.

5534X 88 pages Jan'82 approx. £5.95

THE SOFTSIDE SAMPLER: TRS-80™ ENTERTAINMENT PROGRAMS

Edited by **Joan Witham**

A sampling of SoftSide Magazine's more exciting game programs are compiled in a single book. Twenty-nine stimulating programs in TRS-80 BASIC provide hours of amusement. Test your nautical skills with programs like Sound the Horn and Battleship, partake in a nine-man wrestling contest or jump a motor cycle over ten barrels at a time! Many other thrilling programs are included.

54963 128 pages Feb'82 approx. £6.60

SPEAKING PASCAL

by **K.A. Bowen**

The author employs top-down structured analysis and key examples to illustrate each new idea and encourages the reader to construct programs in an organized manner for complete understanding. After a brief introduction to the structure of computers and the problems of programming languages, the text discusses various components of PASCAL. Elementary and complex data types are covered, as well as the use of control structures, procedures, and functions.

51646 246 pages Dec'81 £9.30

AN INTRODUCTION TO MICROPROCESSORS:
Experiments in Digital Technology

by **N.T. Smith**

Written for the hobbyist or professional who wants to learn how to design digital circuits using integrated circuits, it follows a building block design beginning with the simple inverters and gates and progressing to the highly sophisticated microprocessors.
Design principles are included and are illustrated in the simple projects described.

08678 184 pages Dec'81 £8.50

Z-80 and 8080 ASSEMBLY LANGUAGE PROGRAMMING

by **K. Spracklen**

An extensive introductory look at assembly language programming for the 8080 and Z-80 processors. It is intended to provide just about everything the applications programmer needs to know to get the most out of his or her machine.

51670 192 pages 1979 £7.55

MY MICRO SPEAKS BASEX (AND LOVES IT)

by **Paul Warme**

An in-depth examination of BASEX, a versatile new language for 8080 type microcomputers. It combines the best features of BASIC and executable machine language code. The major advantage of BASEX is speed — programs run up to 20 times faster than similar programs in BASIC. And after typing in your program, you can begin by just typing RUN and giving the starting line number. BASEX is similar to BASIC, and just as easy to learn, but has added features which will benefit the programmer.

51875 168 pages Sept'81 £7.75

PROGRAMMER'S GUIDE TO THE 1802
(with an Assembler for your Machine)

by **T. Swan**

The only assembly language primer that has an assembler! This text teaches assembly language for the 1802 microprocessor. Coverage includes everything from the binary number system and the fundamentals of machine language, to the development of a working 1802 assembler.

51832 166 pages Aug'81 £5.85

USING MICROCOMPUTERS IN BUSINESS:
A Guide for The Perplexed

by **S.S. Veit**

Written by the owner of one of America's largest computer stores selling systems to small businesses, this book is an essential background briefing for any purchaser of a microcomputer system or software. Veit answers the most often asked questions in an easy to read style avoiding technical jargon.

51522 150 pages Nov'81 £7.75

MUSICAL APPLICATIONS OF MICROPROCESSORS

by **H. Chamberlin**

" . . . this book is a milestone in microcomputer history. Its publication marks the progression — from novelty to serious instruments of expression — of musical applications of small computer systems. With little modification, the book could serve as a reference source on generalized data collection, signal processing, and process control using microcomputers."
BYTE Magazine

57539 661 pages Dec'81 £21.00

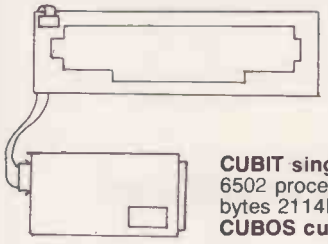
Please write to John Wilson at the address below for a complete catalogue of all Hayden Books and Software.

Distributed by
John Wiley & Sons Limited
Baffins Lane · Chichester · Sussex PO19 1UD · England

● **Circle No. 123**

KNIT YOURSELF A MICROCOMPUTER

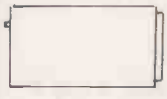
Control Universal Ltd make a growing range of microcomputer boards, using the standard Acorn bus, which can be knitted together into a CUBIT microcomputer, or used to extend other computers, eg aim 65, Atom, Apple, Pet, Superboard.



CU-KEY **£40**
53 key high quality keyboard (non-encoded).

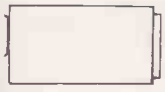
CUBIT single board computer **£83**
6502 processor, 6522 i/o chip (VIA) 4K bytes 2114L RAM, 4K byte ROM.
CUBOS cubit operating system **£20**

EURORACK with buffered backplane. For 14 cards **£98**
For 7 cards plus disk **£69**
For 4 cards **£55**



ACORN VDU card, 25 line display, colour, teletext type, 40 col. **£100**
Monochrome, 80 column **£150**

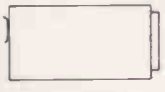
CUMEM holds eight memory devices in two independent banks, can include up to 16K battery — backed CMOS RAM or 64K ROM **£60**



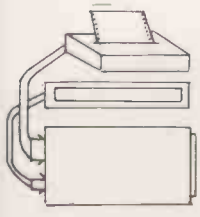
CUBIO 64 channel i/o card
With four PIA (6821) chips **£60**
With four VIA (6522) chips **£70**

CUBAN (the "Wireless World" interface) 16 eight bit analog inputs, one eight bit analog output and 16 digital i/o channels **£120**

FUTURE PLANS



CU-GRAPH. Graphics processor and printer interface. Very high resolution colour graphics, up to 48K bytes display approx **£180**



CU-FACE. Special interface card for compact solutions. Drives a small 40 column impact printer and a 40 character alphanumeric liquid crystal display approx **£100**

All prices quoted 1 off excluding VAT

CONTROL UNIVERSAL LIMITED

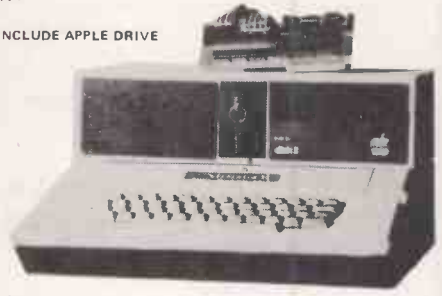
UNIT 2, ANDERSONS COURT, NEWNHAM ROAD, CAMBRIDGE
Tel: CAMBRIDGE (0223) 358757

● **Circle No. 124**

5MB WINCHESTER FOR APPLE II

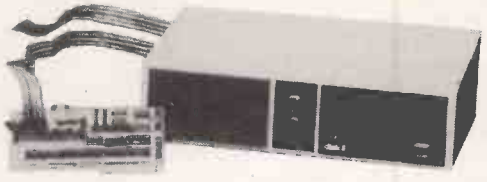
- LOWEST COST/MBYTE FROM ANY SUPPLIER
- SINGLE APPLE CONTROLLER
- PASCAL COMPATIBLE "DROP IN" BIOS
- LICENSABLE "PROTECTED SOFTWARE" OPERATING SYSTEM (only available to bona-fide software suppliers)
- DEDICATED APPLE II
- FAST DELIVERY

SUBSYSTEM DOES NOT INCLUDE APPLE DRIVE



SYMBFILE

LOWEST UK PRICES



apple computer
Sales and Service

R.R.P. £1450

TO PLACE YOUR ORDER, OR TO MAKE FURTHER ENQUIRIES, CONTACT:-

symbiotic computer systems

85/87 STATION ROAD, WEST CROYDON, SURREY CR0 2RD

01-680 8606

● **Circle No. 125**

The unique Computer Supermarket brings you computer hardware at cash-and-carry prices

SHARP, COMMODORE, TEXAS, RICOH, ATARI and TANGERINE EQUIPMENT
Fully tested before despatch, or collection complete with instruction manuals, tapes, fitted 13 amp plugs.

SHARP EQUIPMENT

Model	User Ram	exc VAT	inc VAT
MZ80K	48K Ram	346.96	399.00
MZ80FD	Floppy Disc	589.00	677.35
MZ80P	Printer	385.00	442.75
MZ801/0	Input/Output Unit	87.00	100.05
MZ80B	64K Ram	950.00	1092.50

FREE LEDGER & STOCK CONTROL PROGRAM WITH EVERY COMPLETE SHARP SYSTEM, i.e. 48K Sharp, Twin Floppy Disc, Printer & I/O Unit.

COMMODORE EQUIPMENT

Model	User Ram	exc VAT	inc VAT
4016	40 Col. PET 16K Mem	445.00	511.75
4032	40 Col. PET 32K Mem	560.00	644.00
8032	80 Col. PET 32K Mem	755.00	868.25
4040	347K Disk	560.00	644.00
8050	1 M Byte Disk	755.00	868.25
4022	Printer	350.00	402.50
8024	Printer	975.00	1121.25
8026	Printer	835.00	960.25
8027	Printer	740.00	851.00
VIC 20	Personal Computer	164.35	189.00
VIC/C2N	Cassette Deck	34.35	39.50
VIC 1515	Printer	175.00	201.25
VIC 1011A	RS232 Interface Cartridge	28.00	32.20
VIC 1801	16K ROM Emulator	190.00	218.50
VIC 1210	3K RAM Cartridge	24.50	28.18
VIC 1110	8K RAM Cartridge	34.50	39.68
VIC 1111	16K RAM Cartridge	56.00	64.40
VIC 1212	Programmers Aid	26.25	30.19
VIC 1211M	Super Expander Hi Res. Cartridge	26.25	30.19
VIC 1213	Machine Code Monitor Cartridge	26.25	30.19
VIC Expansion Unit		78.00	89.70
Lid for above expansion unit		6.95	7.99

RICOH

RP1600	Daisywheel Printer PET Interface	1200.00	1380.00

TEXAS EQUIPMENT

TI–99/4 A	242.62	279.00

Full range of peripherals available

ATARI EQUIPMENT

Atari 400 16K	300.00	345.00
Atari 800 16K	560.87	645.00

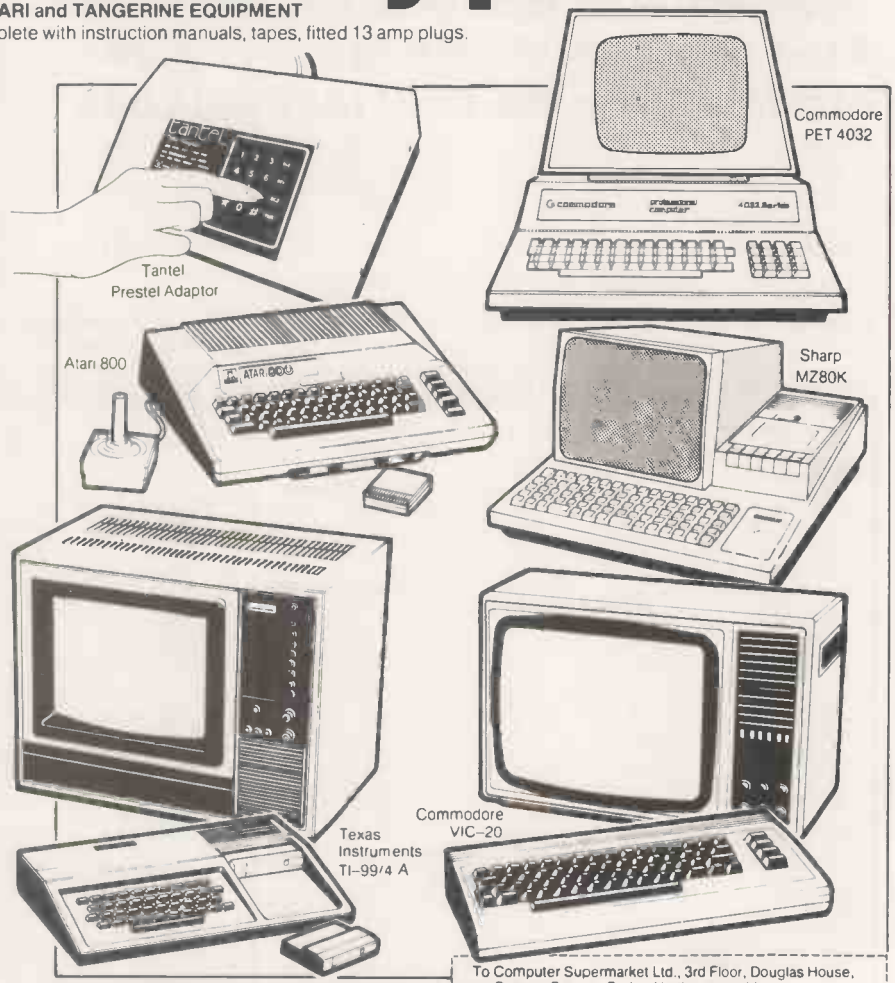
Full range of peripherals available

TANGERINE EQUIPMENT

Micro Tantel Prestel Adaptor	135.00	155.25

Full colour output. Connects to any TV. Full British Telecom approval. Requires British Telecom 96A jack-plug. Gives access to massive home computer base information from Mortgages to Theatres, Stocks to Holidays.
Telephone us for further information on ease of Installation.

Prices are valid only for the cover date month of this magazine



Insured shipment arranged anywhere in UK for an additional £14.37 (inc. VAT). VIC, Atari and Texas shipped by insured post for £3.50 inc. VAT.
Commodore Approved Distributor
Registered Sharp, Atari and Texas Dealer

All goods sold with full manufacturer's warranty and subject to conditions of sale (available on request).
ALL MACHINES ARE FULL UK STANDARD.

To Computer Supermarket Ltd., 3rd Floor, Douglas House, Queens Square, Corby, Northamptonshire.
Please send me

Model No.	Item	Price	Shipment	Total	Info only (✓)

I enclose my cheque for £_____
Or debit my Access/Barclaycard/
Diners Card /American Express No.

(Cardholders may telephone orders to 05366 61587/8 and 62571

Signature _____
Name _____
Address _____
_____
_____ (BLOCK CAPITALS PLEASE)

Your remittance should be made payable to Computer Supermarket Reader's Account, and shall remain your money until the goods have been despatched to you at the address specified.
All goods offered are subject to Computer Supermarket conditions of sale, copies available on request. Reg. in England No. 2646589.
Prestel subscribers may order through the Prestel service, Directory No. 400400.

PC

COMPUTER SUPERMARKET

COMPUTER SUPERMARKET LTD (An associate company of HB Computers Ltd)
3rd Floor, Douglas House, Queens Square, Corby, Northamptonshire.
Telephone 05366 61587/8 and 62571 Telex COMPSU 312517 Prestel No. 400400

● **Circle No. 126**

MAPLIN the people for Atari

3 Consoles available:

Atari 400 with 16K RAM(AF36P) £345
Atari 400 with 32K RAM(AF37S)£395
Atari 800 with 16K RAM (AF02C) £645

Lots of other hardware:					
Cassette Recorder	(AF28F)	£50.00	16K RAM Module	(AF08J)	£64.00
Disk Drive	(AF06G)	£345.00	32K RAM Module	(AF44X)	£125.35
Thermal Printer	(AF04E)	£265.00	32K Upgrade for 400	(AF45Y)	£75.00
Printer Interface for 400	(AF41U)	£49.95	Floppy Disk	(YX87U)	£2.75
Printer Interface for 800	(AF42V)	£49.95	Le Stick	(AC45Y)	£24.95
Interface Module	(AF29G)	£135.00	Joystick Controllers	(AC37S)	£13.95
Versawriter	(AF43W)	£169.00	For full details ask for our hardware leaflet (XH54J) SAE appreciated		

NOW YOU CAN JOIN THE U.K. ATARI COMPUTER OWNER's CLUB. An independent user's group. Four issues of the club magazine for only £1.60! Address your subscription to Graham.

THE CHOICEST GEMS OF ATARI SOFTWARE FROM MAPLIN

Adventure Games			
Star Warrior	C·32K	(BQ24B)	£28.95
Rescue At Rigel	C·32K	(BQ21X)	£22.45
Invasion Orion	C·32K	(BQ23A)	£18.95
Datestones of Ryn	C·32K	(BQ22Y)	£14.95
Galactic Empire	C·24K	(BQ14Q)	£14.95
Hi-Res Adventure // 2	D·48K	(BQ25C)	£24.95
Analog Adventure	D·32K	(BQ33L)	£24.95
Adventure Land	C·24K	(BQ00A)	£14.95
Pirates Adventure	C·24K	(BQ01B)	£14.95
Mission Impossible	C·24K	(BQ02C)	£14.95
Voodoo Castle	C·24K	(BQ03D)	£14.95
The Count	C·24K	(BQ04E)	£14.95
Strange Odyssey	C·24K	(BQ05F)	£14.95
Mystery Fun House	C·24K	(BQ06G)	£14.95
Pyramid of Doom	C·24K	(BQ07H)	£14.95
Ghost Town	C·24K	(BQ08J)	£14.95
Savage Island I	C·24K	(BQ09K)	£14.95
Savage Island II	C·24K	(BQ10L)	£14.95
Golden Voyage	C·24K	(BQ11M)	£14.95
Energy Czar	C·16K	(YG53H)	£8.95
Kingdom	C·8K	(YG55K)	£8.95
Teach-Yourself Programs			
Conversational French	5C·16K	(YG44X)	£32.50
Conversational German	5C·16K	(YG45Y)	£32.50
Conversational Spanish	5C·16K	(YG46A)	£32.50
Conversational Italian	5C·16K	(YG47B)	£32.50
Touch Typing	2C·16K	(YG49D)	£14.95
States & Capitals	C·24K	(YG56L)	£8.95
European Countries & Capitals	C·16K	(YG57M)	£8.95
Learn Programming			
Invitation to Programming	C·8K	(YG43W)	£11.95
Basics of Animation	C·32K	(BQ57M)	£9.95
Basics of Animation	D·32K	(BQ58N)	£10.95
Player Missile Graphics	C·16K	(BQ59P)	£18.95
Player Missile Graphics	D·24K	(BQ60Q)	£19.95
Display Lists	C·16K	(BQ51F)	£9.95
Display Lists	D·24K	(BQ52G)	£10.95
Horiz/Vertical Scroll	C·16K	(BQ53H)	£9.95
Horiz/Vertical Scroll	D·24K	(BQ54J)	£10.95
Page Flipping	C·16K	(BQ55K)	£9.95
Page Flipping	D·24K	(BQ56L)	£10.95
Master Memory Map	Wallchart	(XH57M)	£4.00
Business Programs			
Visicalc	D·32K	(YL39N)	£119.95
Word Processor	D·32K	(YG42V)	£85.00
Calculator	D·24K	(YG50E)	£16.95
Graph—it	C·16K	(YG51F)	£11.95
Statistics	C·16K	(YG52G)	£11.95
Arcade Games			
Star Raiders	E·8K	(YG66W)	£29.95
Asteroids	E·8K	(YG69Q)	£29.95
Space Invaders	E·8K	(YG70M)	£24.50
Missile Command	E·8K	(YG64U)	£29.95
Super Breakout	E·8K	(YG67X)	£29.95
Tari Trek	C·24K	(YL36P)	£8.95
Tari Trek	D·32K	(YL37S)	£11.95
Star Trek 3.5	C·32K	(BQ15R)	£14.95
Race In Space	C·16K	(BQ35Q)	£14.95
Shooting Gallery	C·16K	(BQ36P)	£14.95
Mountain Shoot	C·16K	(BQ12N)	£10.95
Jawbreaker	D·48K	(BQ26D)	£22.95
Basketball	E·8K	(YG61R)	£29.95
Tank Trap	C·16K	(YL34M)	£8.95
Tank Trap	D·32K	(YL35Q)	£11.95
Home Game Programs			
Scram	C·16/24K	(YG58N)	£12.95
Cypher Bowl	C·32K	(BQ20W)	£22.45
Thunder Island	C·16K	(BQ37S)	£10.95
Rotating Tilt	C·16K	(BQ48C)	£14.95
Lunar Lander	C·16K	(BQ16S)	£10.95
Jumbo Jet Lander	C·16K	(BQ46A)	£29.95
Submarine Commander	C·16K	(BQ47B)	£24.50
Sunday Golf	C·16K	(BQ13P)	£10.95
Darts	C·16K	(BQ42V)	£19.95
Tournament Pool	C·16K	(BQ45Y)	£19.95
Snooker & Billiards	C·16K	(BQ44X)	£19.95
Chess	E·8K	(YG63T)	£29.95
Microchess	C·16K	(YL40T)	£15.95
Checker King	C·16K	(YL41U)	£15.95
Cribbage & Dominoes	C·16K	(BQ43W)	£14.95
Poker Solitaire	C·16K	(BQ17T)	£10.95
Blackjack	C·8K	(YG62S)	£8.95
Fast Gammon	C·8K	(YL33L)	£9.95
Reversi (Othello-type)	C·16K	(BQ19V)	£14.95
Gomoko	C·16K	(BQ18U)	£14.95
Hangman	C·8K	(YG54J)	£8.95
Humpty Dumpty & Jack & Jill	C·16K	(BQ38R)	£19.95
Hickory Dickory Dock	C·16K	(BQ39N)	£19.95
British Heritage Jig-Saw Puzzles	C·16K	(BQ40T)	£19.95
European Scene Jig-Saw Puzzles	C·16K	(BQ41U)	£19.95
Atari Safari (25 Programs)	C·16K	(BQ49D)	£18.95
Atari Safari (25 Programs)	D·16K	(BQ50E)	£24.95
Mind Bogglers (3 Programs)	C·16K	(YL38R)	£8.95
Music Programs			
Music Composer	E·8K	(YG48C)	£32.50
Movie Themes (use with Music Composer)	C·16K	(BQ34M)	£9.95
Computer Languages			
Basic A+	D·48K	(BQ31J)	£52.50
Operating System A+	D·48K	(BQ30H)	£52.50
Basic A+ & Operating System A+	D·48K	(BQ32K)	£99.50
QS Forth	D·24K	(YL29G)	£44.90
Pilot	E&2C·8K	(YG69A)	£49.50
Utilities			
3D-Super Graphics	D·48K	(BQ28F)	£29.95
3D-Super Graphics	C·48K	(BQ29G)	£29.95
Atari World (Graphics)	D·48K	(BQ27E)	£43.95
Assembler Editor	E·8K	(YG68Y)	£34.50
Assembler	C·16K	(YL32K)	£14.95
6502 Disassembler	C·8K	(YL30H)	£8.95
6502 Disassembler	D·8K	(YL31J)	£11.95
Character Generator	C·16K	(YL27E)	£9.97
Character Generator	D·16K	(YL28F)	£12.50
Telelink	E·8K	(YG59P)	£14.95

Key: C = Cassette, D = Disk, E = Cartridge. 2C = 2 Cassettes etc. 8K; 16K etc. shows minimum memory requirement.

Send sae now for our new software leaflet with details of all the above programs. Order As XH52G — Issue 2.
Lots of exciting new software titles available soon. Keep in touch with Maplin!
Subscribe now to America's leading Atari-only magazine — Analog — 6 Issues per year for just £9.00. Order as GG24B.

MAPLIN

Maplin Electronic Supplies Ltd
P.O. Box 3, Rayleigh, Essex.
Tel: Southend (0702)
552911/554155.

Demonstrations at our shops NOW
See the amazing Atari's in action at
159-161 King St., Hammersmith W6
Tel: 01-748 0926
or at 284 London Road,
Westcliff-on-Sea, Essex.
Tel: (0702) 554000

Note: Order codes shown in brackets. Prices firm until 15th May, 1982 and include VAT and Postage and Packing (Errors excluded).

● Circle No. 127

"The best value for money on the small business systems market"

Which Computer? Jan'81

SUPERBRAIN

A smart, fully self-contained desk-top unit – that's the SUPERBRAIN microcomputer. It will operate as a complete business system, as a word processor (allied to a high quality printer) and as an intelligent terminal.

- **320K, 680K and 1.5 MB disc drives**
- **Wide range of standard packages**
- **Full graphics facility**
- **Nationwide dealer network**

SUPERBRAIN is ideal for both first time buyers needing a general purpose machine, and for users wishing to upgrade from a personal microcomputer system. Its CP/M operating system will handle the most sophisticated programs. Twin Z80 microprocessors and an RS232 communications port make it easy to extend the system in the future.

The Icarus dealer network

ABRAXAS COMPUTER EMPLOYMENT, 357 Euston Road, LONDON NW1 3AL. Tel: 01 388 2061

A.P. LTD, Maple House, Mortlake Crescent, CHESTER CH3 5UR. Tel: 0244 46024

AMCO LTD, Playfair Road, LEEDS LS10 2GP. Tel: 0532 708321

BUSINESS INFORMATION SYSTEMS, 602 Triumph House, 189 Regent Street, LONDON. Tel: 01 437 1069

BORDER COMPUTING LTD, Dog Kennel Lane, BUCKNELL, Shropshire. Tel: 054 74 368

CAMBRIDGE MICRO COMPUTERS, Cambridge Science Park, Milton Road, CAMBRIDGE. Tel: 0223 314666

COMMONSENSE COMPUTING LTD, P.O. Box 7, BIDEFORD, Devon. Tel: 02372 4795

CONQUEST COMPUTER SALES LTD, 92 London Road, BENFLEET, Essex. Tel: 03745 59861

CULLOVILLE LTD, Thornfield, Woodhill Road, SANDON, Chelmsford, Essex. Tel: 024 541 3919

DATA PROFILE, Lawrence Road, Green Lane, HOUNSLOW, Middlesex. Tel: 01 446 1917

DATA WARE, 48 Eaton Drive, KINGSTON, Surrey KT2 7QX. Tel: 01 546 2984

DAYTA, 20b West Street, Wilton, SALISBURY, Wilts. Tel: 0722 74 3898

DRAGON SYSTEMS LTD, 17 Walter Street, SWANSEA, W. Glam. Tel: 0792 749486

DUPLEX COMMUNICATIONS, 2 Leire Lane, Dunton Bassett, Lutterworth, LEICESTERSHIRE. Tel: 0455 209131

EASIBEE COMPUTING LTD, 133/135 High Street, LONDON E6 1HZ. Tel: 01 471 4884

ESCO COMPUTING LTD, 154 Cannongate, EDINBURGH. Tel: 031 557 3937

ESCO COMPUTING LTD, 40a Gower Street, GLASGOW G51 1PH. Tel: 041 427 5497

EFFICIENT BUSINESS SYSTEMS, 9 Clarence Street, BELFAST 1, N. Ireland. Tel: 0232 647 538

E.M.G. MICROS, 30 Heathfield Road, CROYDON, Surrey. Tel: 01 688 0088

EMTEK, 40 South Furzeham Road, BRIXHAM, Devon. Tel: 08045 3566

FARMFAX LTD, 17 Hylton Road, PETERSFIELD, Hants. Tel: 0730 66123

FOREST ROW COMPUTERS, 53 Feshfield Bank, FOREST ROW, East Sussex. Tel: 034282 4397

G.T. OFFICE SYSTEMS, 12 Clovelly Road, LONDON W5 5HE. Tel: 01 567 9959

JAEMMA LTD, Unit 24, Lee Bank House, Holloway Head, Lee Bank, BIRMINGHAM. Tel: 021 643 1609

JENNINGS COMPUTER SERVICES, 55/57 Fagley Road, BRADFORD, W. Yorks. Tel: 0274 637867

LONDON COMPUTER CENTRE, 43 Grafton Way, LONDON W1. Tel: 01 388 5721

MICROAGE LTD, 53 Acton Road, LONG EATON, Nottinghamshire. Tel: 06076 64264

M. G. ENTERPRISES, 32 Rue Victor Hugo, 92800 Puteaux, France.

MICRO-K, 186 Martin Way, MORDEN, Surrey. Tel: 01 543 1119

MICRO SOLUTION LTD, Park Farm House, Heythrop, CHIPPING NORTON, Oxon. Tel: 0608 3256

NORTHERN COMPUTERS LTD, 128 Walton Road, Stockton Heath, WARRINGTON. Tel: 0925 601683

OMEGA ELECTRIC LTD, Flaxley Mill, Flaxley Road, MITCHELDEAN, Glos. Tel: 045 276 532

MICROCOMPUTER SPACEDROME, 12 Dene Road, Southgate, LONDON N11 1ES. Tel: 01 368 9002

RANMOR COMPUTING LTD, Nelson House, 2 Nelson Mews, SOUTHEND-ON-SEA. Tel: 0702 339262

ROGIS SYSTEMS LTD, Keepers Lodge, Frittenden, NR. CRANBROOK, Kent. Tel: 058 080 310

S.D.M. COMPUTER SERVICES, Broadway, BEBINGTON, Merseyside L63 5ND. Tel: 051 608 9365

S.M.G. MICROS, 39 Windmill Street, GRAVESEND, Kent. Tel: 0474 55813

SAPPHIRE SYSTEMS, 19-27 Kents Hill Road, BENFLEET, Essex. Tel: 03745 59756

SHEFFIELD COMPUTER CENTRE, 225 Abbeydale Road, SHEFFIELD S7 1FJ. Tel: 0742 535 19

SORTFIELD LTD, E. Floor, Milburn House, Dean Street, NEWCASTLE-UPON-TYNE. Tel: 0632 329593

SPOT COMPUTER SYSTEMS LTD, New Street, Kelham Street Indus. Estate, DONCASTER, S. Yorks. Tel: 0302 25159

STAG TERMINALS LTD, 30 Church Road, TEDDINGTON, Middlesex. Tel: 01 943 0777

STUKELEY COMPUTER SERVICES, Barnhill, STAMFORD, Lincs. Tel: 0780 4947

TERMACRE LTD, 126 Woodwarde Road, LONDON SE22 8TU. Tel: 01 693 3037

THAMES VALLEY COMPUTERS, 10 Maple Close, MAIDENHEAD, Berks. Tel: 0628 23532

TURNKEY COMPUTER TECHNIQUE, 23 Calderglen Road, St. Leonards, EAST KILBRIDE. Tel: 03552 39466

THE COMPUTER ROOM, 87 High Street, Tunbridge, Kent. Tel: 0732 355962

WELSH BUSINESS SYSTEMS LTD, 1 Windsor Chambers, Windsor Arcade, PENARTH. Tel: 0222 700059

WING SYSTEMS LTD, 406 Winchester Road, SOUTHAMPTON. Tel: 0703 768338

For further details, or if you want to become a dealer yourself, contact:

ICARUS

Computer Systems Ltd.

Icarus Computer Systems Ltd. Deane House 27 Greenwood Place London NW5 1NN Tel: 01-485 5574 Telex: 264209

● **Circle No. 128**

SPECIAL OFFERS

PETS

OFFICIALLY APPROVED COMMODORE DEALER

CBM 4016 — 16K 12" Screen 40 Col. Computer.
CBM 4032 — 32K 12" Screen 40 Col. Computer.
CBM 2031 — 170K Single Drive Floppy Disk.
CBM 4040 — 340K Twin Floppy Disk Drive.
CBM 4022 — 80 Col. 65cps Tractor Printer.
CBM 8032 — 32K 80 Col. 12" Screen Computer.
CBM 8096 — 96K 80 Col. 12" Screen Computer.
CBM 8050 — 1 Meg. Twin Floppy Disk Drive.
CBM 8422 — 22 Meg. Winchester Disk Drive.
Please phone for latest prices.
We offer some of the best deals around!

APPLES

Apple II — 48K Computer.
Apple III — 128K Computer.
Video Monitors — Colour and Black & White.
Disk Drives.
Silentype Printer.
All Apple related products available. Please call for prices.

PRINTERS

Epson MX80FT — 80/132 Col. Friction/Tractor.
Auto Bi-Directional. 9x9 Head True Descenders.
Ricoh RP1600 — 164 Col. 60cps Daisy Printer.
Scripta — 17cps Daisy Printer at low prices.
We will quote for any type or make of printer available.

DEMONSTRATIONS AT YOUR PLACE

We are able to demonstrate complete business systems at your site in our mobile demonstration unit (up to 4 people at a time).
Just phone for an appointment anytime.

VIC

VIC20 — Computer. Works with your colour TV.
VIC1530 — Cassette Unit.
VIC1540 — Single Floppy Disk Drive.
VIC1515 — Printer.
Expansion Memory, Games Cartridges, Programmers' Aids & Tutorials.
Low price computer. New accessories coming in all the time. Call for latest news and prices.

SOFTWARE

Word-processing
Payroll
Incomplete Records
Book-keeping
Invoicing
Stock Control
Sales Ledger
Purchase Ledger
Record Keeping
Financial Packages
Time Recording
Silicon Office

INTELLIVISION

Superb TV Game for your TV. Cartridges include: Space Battle, Skiing, Boxing, Poker, Golf, Tennis, Roulette, Horse Racing, Basketball, Backgammon & many others.
Free soccer game with unit.

BOOKS

Full range of computer books available from Beginners Guides to Advanced Machine Code Programming.

2'ND HAND

We have a constant changing range of 2'nd hand and ex-demo equipment at considerable savings.

ACCESSORIES

All types of accessories and stationery supplied.

Floppy Disks
Storage Boxes
Printer Ribbons
Tractor Feeds
Cassettes
Maintenance
Stationery
Continuous Labels
Daisy Wheels
Auto Sheet Feeders
Dust Covers
Installation & Training

Da Vinci Computer Shop

DAVINCI COMPUTER SHOP

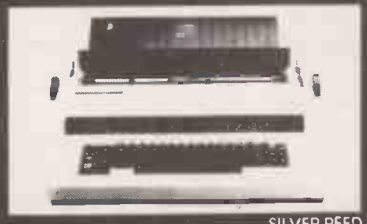
65 High Street,
Edgware, Middx.
HA8 7DD.

Open Mon-Fri 9.00-5.30
Sat 9.30-5.00
Telephone: 01-952 0526

Barclaycard VISA

● Circle No. 129

WE TURN ELECTRONIC TYPEWRITERS INTO COMPUTER PRINTERS



SILVER REED

OLYMPIA

OLIVETTI

If you have one of these, your local typewriter/computer dealer can arrange for the upgrade.
The discom upgrade enables most popular electronic typewriters to communicate with any micro computer.
Interfaces fitted as standard on each machine are: RS 232, Centronics IEEE.

** Interfaced machines are available from your local dealer.*

discom

Old Manor Farm, Ashton under Hill
Worcestershire
Telephone (0386) 881962

Please send me more details

Name _____

Address _____

_____

Telephone _____

● Circle No. 130

UNLIMITED PERSONAL TUITION IN BUSINESS BASIC- FOR JUST £39.50

* Offer applies to UK and Ireland only.

Cassette player is not included in the offer.

With this remarkable new self-teach package from the National Computing Centre, you can master Business Basic in your own time, at your own pace, and on your own microcomputer.

The Business Basic Self-Teach Programming Course is an imaginative, practical, and realistic approach to learning the most widely used of all microcomputer programming languages.

The course draws on NCC's unrivalled expertise in developing effective training methods. It is based on the Centre's wide experience of the real needs of the business user. It teaches not only Basic as a *business programming language* but also good business computing practice. And it is applicable to Basic on any microcomputer.

Hands-on learning

The heart of the package is the *Workbook:* a systematic step-by-step guide through every feature of Business Basic. And right from page one you'll be learning in the best possible way — at the keyboard of your computer as you work through the hundreds of practical 'activities' which illustrate the facilities of Basic and their use.

Making the point

The *Audio Tape* is an integral part of the package which you will use throughout the course. Its purpose is to introduce new ideas, emphasise important concepts, and give a detailed explanation of some of the more difficult tasks. In all of these areas the spoken voice has proved invaluable in ensuring effective communication.

Checking progress

At frequent intervals you will be given more formal tasks — for example, modifying, writing, or explaining a program — to ensure that you can put what you have learnt to practical use. Solutions to these problems are contained in the separate *Answer Book.*

Putting Business Basic to work

When you have completed the *Workbook*, the *Application Study Guide* sets six real-life 'Assignments' — creating programs for such commercial applications as order analysis, mailing list creation, stock file maintenance, and invoice production. Each assignment includes a brief and an analysis of the programming task. The *Guide* includes program listings, sample runs, and explanatory notes on which to base your solution.

Business Basic and your computer

Different computers have different versions of Basic. The *Workbook* points out where there are likely to be differences, tells you when to check with your suppliers manual, and encourages you to note these differences as they occur on the *Reference Card.* By the end of the course, therefore, this card will have become a convenient reference summary specifically related to your machine.

The complete *Business Basic Self-Teach Programming Course*, including *Workbook, Answer Book, Application Study Guide, Reference Card*, and audio cassette, costs just £39.50 including VAT.

At that price it's probably the best investment you'll make in business computing.

Return the coupon today for your copy.

The National Computing Centre Limited
Oxford Road, Manchester M1 7ED Tel: 061-228 6333

NCC
The National Computing Centre

Order Form

To: Marketing Manager
The National Computing Centre Limited
Oxford Road
Manchester M1 7ED

Please supply to

Name _____

Position _____

Company/Organisation _____

Address _____

_____

Telephone _____ Signature _____

Cheques should be made payable to NCC Ltd Or debit my Access/Barclaycard

No. _____ ACCESS BARCLAYCARD VISA

Signature _____

Name _____ Address _____

_____

REG No 881195

● Circle No. 131

35

PC

low cost high quality interfaces....

We are specialist suppliers of CBM PET and HP 85 compatible interfaces.

We also supply complete systems for industrial and laboratory monitoring and control.

Custom design undertaken.

Callers welcome for demonstration.

OFFICIALLY APPROVED COMMODORE DEALER

OFFICIALLY APPROVED BY COMMODORE

Digital Design and Development

18 19 Warren Street London W1P 5DB Tel 01 387 7388

IEEE-488 compatible systems....

● 8 channel 12-bit A/D convertor	£600
● 8 channel 12 bit D/A convertor	£695
● 16 channel 12-bit A/D convertor with software programmable amplifier.	£850
● 16 channel 8-bit A/D convertor	£300
● 8 channel 8-bit D/A convertor	£350
● X-Y analog plotter interface	£200
● digital data input unit, 64 bits	£400
● digital data output unit, 64 bits	£350
● 16 channel relay control unit	£350

All the above units are boxed complete with IEEE-488 address internally selectable, integral power supply, switch, fuse, indicators etc. Illustrative BASIC software supplied.

● user port convertor A/D plus D/A	£200
● fast data acquisiton system 40,000 readings per sec. 4 A/D + 4 D/A	£950

All prices EX-VAT.

● Circle No. 132

INGENIOUS Genie I

All the features of the EG3003 system plus: * *Machine Language Monitor*
* *Fitted Sound* * *Renumber Command*
* *Full Lower Case* * *Screen Print*

16K

£295 + VAT

Genie II

The MacroComputer

Offering all the advantages of the Genie I system, with the benefit of advanced design for the professional user.

* *4 Defineable Function Keys*
* *Full Upper & Lower Case*
* *Terminal Routines*
* *Facility to upload & Download*
* *Screen Print*
* *Includes T.V. Modulator*

£299 + VAT

The most compact 80 column impact graphic-dot printer available

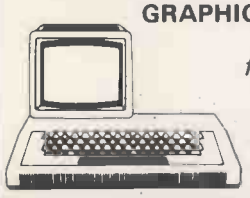
at a very compact price

seikosha GP80 printer

£195 + VAT

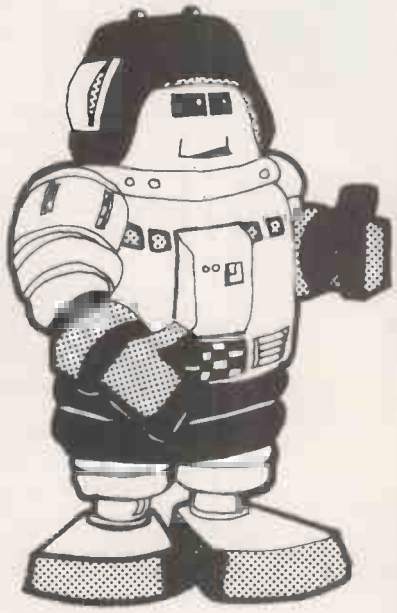
Acorn Atom

Special features include
*FULL SIZED KEYBOARD
*ASSEMBLER AND BASIC
*HIGH RESOLUTION COLOUR GRAPHICS



from:

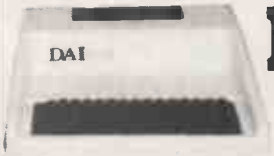
£120 + VAT



The Second Generation Personal Computer

Highest performance lowest price

* 48K
* 16 Colours
* Multiple Resolution Graphics
* Split screen modes



DAI

£595 + VAT

TANTEL

'PRESTEL' adaptor

Converts any black and white or colour T.V. for 'PRESTEL' reception.

£170 + VAT

EG3014

Special adaptor to allow connection of TRS 80 to GENIE periferals

EG3023

GENIE low cost 16K expander

FOR
PAPER
DISK-ETTES
BITS
RIBBONS for most printers
LABELS
BOOKS
SOFT-WARE
LATEST SECOND-HAND PRICES Ring: 0225-334659
MONITORS

Printers

EPSON MX80
EPSON MX100
ANADEX
PAPER TIGER
T.E.C.
SCRIPTA
MICROLINE 80

MicroStyle

all this and much much more . . . .

29 Belvedere, Lansdown Road, Bath.
Telephone: (0225) 334659.

● Circle No. 133

YOUR DATA LIFELINE

The DATALIFE Series of magnetic media from Verbatim, incorporates many advanced data shielding benefits. These ensure a longer, more trouble-free recording, storage and retrieval life – quite simply Datalife is the best range of media available today.

And now BFI, the UK's major distributor of Verbatim products, has introduced a new service – called the Datalife Line. Call us on the Datalife Line and we can offer you fast deliveries, competitive prices on Verbatim products, excellent back-up and technical advice on flexible disks, mini diskettes, data cartridges, digital cassettes, alignment disks, XE disks and Datalife head cleaning kits.

CALL THE Datalife™ LINE NOW:

01-941-4066

BFI

Scottish Distributor:
Computer Supplies Co.,
8/18 Union Street, Bo'ness,
West Lothian, Scotland.
Tel: 050-682-3393

BFI Electronics Ltd.,
516 Walton Road,
West Molesey,
Surrey. KT8 0QF
Tel: 01-941 4066
Telex: 261395

● Circle No. 134

apple '82
® 1st National Apple User Convention

Reserve these dates now!

Apple User Convention – June 5-6	Apple User Exhibition – June 4-6

It's going to be the biggest Apple event ever held – and a MUST for all Apple users.

From Friday, June 4 to Sunday, June 6, the whole of the ultra-modern Fulcrum Centre in Slough will be completely devoted to the Apple.

And it will be an action-packed weekend. Some of Britain's top Apple experts will be revealing their secrets. There will be hands-on demonstrations of Apple programs. Plus a comprehensive exhibition of all the latest Apple hardware and software.

There's bound to be a big demand for Apple '82 – so early booking is advisable.

DELEGATE APPLICATION FORM

I wish to attend Apple '82, the First National Apple User Convention.

Please reserve ..... delegates places at £12 per delegate £ .....

I would like you to arrange accommodation for the following nights:

Friday June 4 ☐ Saturday June 5 ☐

for ..... adults and ..... child(ren). Accommodation costs £17.00 per night for a single bed in a twin room. Single rooms are available for £21.00.
Children under 5 years free.
Children over 5 and under 14 years £1.00.
Accommodation includes bed, Continental breakfast, VAT and service charge.
All extras to be paid for separately on departure. £ .....

Please give preference of hotel in order of choice:

Post House Hotel ☐ Excelsior Hotel ☐
Ariel House ☐ Skyway Hotel ☐

I would like to reserve a car parking space for the duration of the Convention. (£2.00). £ .....

TOTAL £ .....

I enclose my cheque as payment, or debit my Access/Barclaycard/American Express account No.

Signed .....
Company .....
Name .....
Position .....
Address .....
..... Tel: .....

Please tick appropriate box if interested in any of the following:

Coach trips to London for shopping ☐
Coach trips to London for theatre ☐
Choice of play or show .....
Coach trip to Windsor Safari Park ☐
Coach trip to Windsor Castle ☐
Coach trip to Oxford ☐

The above will of course depend on sufficient people being interested in particular trips. PC/3

POST TO: Apple '82, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

● Circle No. 135

SEIKOSHA

The Seikosha GP100A
Manufactured by the Seiko Company, Japan.

The micropriced microprinter

80 col dot graphics for around £215 EX. VAT.

Seikosha introduce the GP100A. A wider and updated version of the highly successful GP80. Now able to take standard width paper, the amazingly compact GP100A offers big printer performance at a fraction of the cost.

With a high quality output that includes full graphics capability, the Seikosha's proven reliability and variety of interfaces make the GP100A the ideal choice for hobbyists, educationalists and businessmen. Full service support is provided by DRG Business Machines' nationwide distributor network.

FEATURES INCLUDE:

- 80 col. 30 cps.
- Dot Matrix unihammer action.
- ASCII standard. 116 characters.
- Full graphics.
- Upper and lower case.
- Double width printing.
- Up to 10" paper width.
- Original + 2 copies.
- Tractor feed.
- Self testing.

INTERFACING for most systems:

- Standard: Centronics.
- Options: RS232C, Serial TTL, 20mA current loop. 1EEE-488. Apple II, Sharp (GP100D).

DIMENSIONS:

Depth – 9¼" (234mm)
Width – 17¼" (420mm)
Height – 5¼" (136mm)

OPTIONS:

- Pinch feed.

DRG BUSINESS MACHINES

Telephone the number below and we'll tell you where your nearest distributor is located.
See the remarkable Seikosha GP100A in action.

39

(Peripherals & Supplies Division) 13/14 Lynx Crescent, Winterstoke Road, Weston-super-Mare, BS24 9DN. Tel: (0934) 416392. ● Circle No. 136

THE FINEST WORLDWIDE SUPPORTED NATIONWIDE.

DRG (UK) Ltd, Reg No. 22419 England.

MICRO TRAINING FOR COMPUTER USERS

6 Micro courses at Digitus

Which would you like to attend?

Digitus is running a number of courses to train users and potential users in the basic skills of micro-computing. Conducted at our Central London Workshop, the courses provide hands-on experience of microcomputers, demonstrations of working systems and tutorials on your particular needs.

INTRODUCTION TO MICROCOMPUTERS

One day's concentrated information on microcomputing aimed at the potential user in small and large organisations. A practical course which includes business applications of micros, guidelines on selecting microcomputer systems and an introduction to programming.

WORDSTAR WORDPROCESSING

A one day course for people who want to learn the fundamentals of wordprocessing. Uses the popular Wordstar wordprocessing package available on most CP/M micros and teaches by hands-on use.

MICRO-PRO SOFTWARE TOOLS

In addition to Wordstar, Micro-Pro Inc have produced a variety of aids to improve productivity in offices and systems departments. This one day course includes: Mail-Merge linked to Wordstar • Supersort sorting utility • CalcStar rows and columns manipulation • DataStar information manager • harnessing the 'Star' products together.

All courses provide access to an extensive range of micro hardware, software and expertise.

Note: Wordstar and DataStar are registered trademarks of Micro-Pro Inc.

FUNDAMENTALS OF PROGRAMMING IN BASIC

A two day course designed to teach the first principals of programming in BASIC. Aimed at those with some understanding of micros who want to learn how to instruct their computer to perform tasks.

DATASTAR INFORMATION MANAGEMENT

The DataStar data entry, retrieval and management system is a powerful aid which enables the educated user and computer professional to build inform ation systems economically and rapidly.

IMPROVE YOUR BASIC

A two day course for those who have learned Basic from hands-on experience and want to brush up their BASIC techniques and learn some timesaving software tools.

Training for Computer Professionals
Course in: Micro Technology for Management • Local Area Networks • Micros for Computer Professionals.
Courses are run at the Workshop or on site. Telephone or write for details.

Micro Technology Workshop Set in 8,500 sq.ft in Central London, the Workshop is a few minutes from Covent Garden, Trafalgar Square, Charing Cross, Embankment and Waterloo stations. Specialist areas include: Personal Computers, Technical Systems, Business Systems, 16 bit and Local Network Systems, Bookstore and Training Rooms.

Booking and Fees The fee for all courses is £80 per day plus VAT, payable 14 days prior to starting date.

Booking Form (Please complete in BLOCK capitals)
To Digitus Ltd, 10-14 Bedford Street, London WC2E 9HE. Tel 01-379 6968

☐ Please send me further information ☐ Reserve places as follows:

Name of delegate ..... Date .....

Name of delegate ..... Date .....

Name of delegate ..... Date .....

Courses/dates

Introduction to Microcomputers	☐ Feb 8	☐ Apr 19
Fundamentals of Programming in Basic	☐ Feb 9/10	☐ Apr 20/21
Improve your Basic	☐ Feb 11/12	☐ Apr 22/23
Wordstar Wordprocessing	☐ Feb 23	☐ May 11
Micro-Pro Software Tools	☐ Feb 24	☐ May 12
DataStar Information Management	☐ Feb 25	☐ May 13

Digitus

Company/address .....

.....

Name ..... Position .....

Signature ..... Tel.No. ..... PRC

● Circle No. 137

The end of history

THERE is a very touching play currently running in London. It is written about a most unpromising subject: the passions of the bibliophile. *84 Charing Cross Road* is contrived from the genuine correspondence of a lady living in New York during the Second World War, and a firm of antiquarian booksellers at the address mentioned.

She finds it easier to order the books she wants — many of them 100 years old or more — from London, than to struggle through New York's inferior shops. As the correspondence continues she becomes friends by post with the staff of the shop. When at last she comes to London to see them they are all dead or gone. The play ends with the bookshop being closed. Its shelves are empty: it is all very sad.

No doubt the audience just felt unhappy that she had failed to meet the people she had come to know so well by post. For us it ought to be doubly sad because it is clear that the bookshops of the world are in a like condition, and that we are the murderers.

Why should you care? Books are heavy, expensive, slow, immediately out-of-date. These criticisms apply to other paper publishing as well — technically this magazine is a fairly ridiculous object. It takes us months to produce each issue. It has to be copied on to 30 tons of paper and physically carried round the world. After a week, a month, a year, almost every copy has been thrown away. Print and paper cost us about half our income.

The people that are really keen on electronic publishing are, ironically enough, the conventional publishers of today — it will save them so much money. It is infuriating to have to produce books and magazines by typing them on to paper, encoding them into electronic pulses to set them in type, then printing on paper and taking issues by lorry and train to the reader. The reader almost certainly has a telephone wire through which the same information could speedily be delivered, and a TV screen on which to display it.

There are plenty of obviously bad things about paper publishing. What are the good things? Firstly, it is very simple and very permanent. If we had been brought up on electronic data processing and knew no other way, the invention of paper would occasion the wildest enthusiasm. "What! You just boil up a tree for your non-volatile memory? What is the refresh time — a thousand years? Oh, wow! And your writing technology— a burnt *stick?* "This product has to be a panic"!

Many of its other advantages are shared by electronics. It permits knowledge and ideas to flow forward in time and sideways in space. Before paper a man could only, if he was lucky, pass on what he knew to a few dozen students during his lifetime. They in turn had to repeat what they knew to their students — and the seed fell so often on sterile ground that ideas could barely hold their own against the contrary forces of death, boredom, savagery, drunkenness, whoring and war

Once printing had got going, the mechanical process of making identical sheets and spreading them around the place guaranteed permanence to ideas and exposed large numbers of people to them. Consequently, if the ideas behind steam engines were in the air, one could be confident that somewhere, someone had read the relevant texts and would set about building one.

Of course, book-lists, libraries, bibliographies and all the paraphernalia of scholarship help the whole process along, but the fundamental virtue of paper is that, given quite ordinary care, it is almost indestructible. We know what books Caxton printed and how much he charged for them because his catalogue survives. He printed enough of them to blow about the world like dried leaves, and some blew into crannies where they survived long enough to be recognised as treasures

Although many strong-minded regimes down the ages have tried to rewrite history by calling in and burning those books they disapproved of, experience shows that once a book has been printed and distributed it is virtually indestructible. In fact books that have completely disappeared are so rare as to rank as curiosities.

Perhaps one copy in every 1,000 that we print of this magazine will survive 100 years; one copy in 10,000 might last 1,000 years. If, then, it is interesting enough it can be translated into whatever language the English speak, re-edited, republished and sent off on another voyage through time and space. By the simple act of printing this sentence, the idea it contains is added indelibly to the store of human knowledge.

What happens when all this is done electronically? True, the transmission and display of information is potentially much faster and much cheaper than its paper equivalent. People can have just the information they want and they can ignore what they do not want. They can be helped to find what they want by the machine, so they can make use of a much bigger pool of data than would otherwise have been at their disposal.

On the down side, however cheap computer storage becomes it is very unlikely to have the permanence that multiple copies of books have, if only because the data will only exist in one or two sites. It is as if only one, two, half a dozen copies were printed of any book. Their chance of surviving the carelessness or malice of posterity becomes small and they will disappear as so many thousands of handwritten Greek and Roman books have disappeared.

Future generations might be very interested — for reasons we cannot guess at now — to see *Practical Computing*'s first Prestel pages, just as we would be interested in a printing magazine published by Caxton. They cannot have them though — we cannot see them now — because they have all gone. The BBC recently wiped the early episodes of *Doctor Who* — not for any ideological reasons, but just to reclaim a few thousand metres of video tape.

Scripts of the plays and concerts that amused our parents are still to be found and give some idea of the real thing. But how much of the entertainment, the news reports or the documentaries of the last 20 years on TV will survive 100 years — or has survived even to today? Future generations will be presented with an invisible world. History will say what we did, but very little about what we thought we were doing while we did it.

Happily there is still a voluminous printed record, though it is already under fierce attack. In 20 years' time the electronic record may be all there is.

The invention of the telephone has robbed us of enormous quantities of evidence. Think of the Victorians' letters that detail every moment of their lives — there were 10 posts a day in Byron's London. In 20 years' time even the skimpy letters and newspapers of today will be electronic. For the purposes of the historian, they will be no more information than a mirage.

No doubt the book and the magazine will survive, because time will show them to have advantages over electronic media, however they evolve. But at what cost? This summer you may see stalls at country bring-and-buys where books are sold for 10p each, and have difficulty in resisting the temptation to buy them all. If you can see that soon the cheapest book will cost £20 and that vast amounts of the world's literature will never see print again, even an unreadable book at that price is a bargain, and anything which is any good becomes a gift from the gods.

THE REAL COST OF A SHARP COMPUTER SYSTEM

We could simply scream at you 'Get a Sharp MZ-80K personal computer for only £305!'

But you know, and we know, that there's more to it than that. As your interest increases or your business grows, you will want to exploit the unique versatility of your Sharp system – MZ-80K, MZ-80B or PC-3201.

So we thought we would set your mind at rest about the cost of expansion. We print here *all* the prices relevant to system expansion on these three popular and widely recognised computers.

If you think this demonstrates a straightforward and workmanlike attitude on our part, just look at the prices. You will see that they are just as down-to-earth as the rest of our approach.

Butel-Comco support for Sharp users is *complete*. Advice is freely available. Maintenance contracts can be arranged. A wide range of supplies and software can be supplied.

New Lower Prices

THE BUTEL PRICE GUIDE

Sharp MZ-80K Personal Computer

MZ-80K	Computer 20K. 25cm CRT. Tape cassette. ASCII keyboard.	£305.00
MZ-80K	Computer 48K.	£347.00
MZ-U/G	28K upgrade.	£80.00
MZ-80 I/O	Interface unit.	£82.00
MZ-80FD	Dual disk drive.	£693.00
MZ-80FDK	Additional dual disk drive.	£616.00
MZ-80	RS232 interface.	£110.00
MZ-80P3	Matrix printer.	£395.00
CP/M	Operating system.	£196.00
MZ-80 I/O-1	Universal interface card.	£50.00
MZ-80BM	BASIC manual.	£7.00
MZ-80T10B	BASIC tape.	£9.00
MZ-80T20C	Machine language tape and manual.	£19.00
MZ-80TU	Assembler tape and manual (System Program).	£38.00
MZ-80T40E	PASCAL interpreter manual and application tape.	£50.00

Sharp MZ-80B Personal Computer

MZ-80B	Computer 64K. 23cm CRT. Tape cassette. ASCII keyboard.	£966.00
MZ-80FD	Twin floppy disk unit.	£590.00
MZ-80FDK	Additional twin floppy disk unit.	£590.00
MZ-80P5	Matrix printer, 80cps. 80col.	£415.00
MZ-80FI	Floppy disk interface card.	£100.00
MZ-80MDB	Master diskette and manual.	£31.00
MZ-80F15	Cable for MZ-80FD.	£9.00
MZ-FO5	Cable for MZ-80FDK.	£7.00
MZ-BCJ	Floppy disk cable jointer.	£15.00
MZ-80EU	Expansion unit.	£50.00
MZ-80GMK	Graphic RAM-II option.	£120.00
MZ-80 I/O-2	Universal interface card.	£45.00
MZ-80T10C	MZ-80K to MZ-80B converter tape.	£7.00
CP/M.	Operating system.	£65.00

Sharp PC3201 Business Computer

PC-3201	Computer 64K. ASCII keyboard.	£1500.00
CE-320C	80x25-character display terminal.	£250.00
CE-332P	80cps, 80/132col matrix printer.	£450.00
RP-1600/5	60cps, 132col daisywheel High-Q printer.	£1495.00
CE-331M	Twin floppy diskette unit.	£670.00
CE-341M	Floppy diskette interface.	£125.00
CE-350L	Additional diskette drive cable.	£30.00
CE-332A	48K RAM upgrade.	£150.00
CE-340R	RS232 interface card.	£150.00
CE-340G	General purpose I/O parallel interface card.	£145.00
CE-350R	Printer ribbon for 332P.	£8.00
	10x5¼in diskettes.	£30.00
CE-330G	Direct program generator.	£120.00
	Sales Ledger program and manual.	£300.00
	Purchase Ledger program and manual.	£300.00
	Nominal Ledger program and manual.	£450.00
	Invoicing System program and manual.	£300.00
	Stock Control program and manual.	£300.00

Note: All prices quoted exclude VAT, freight costs and insurance.

All items are available through our fast and efficient Mail Order Service or come and collect it from our 'computer centre' counter. We accept Access and Barclaycard and can arrange Citibank hire purchase. Simply ask for a quotation.

Hours of business:
Mon-Fri 9:30-5:30 and Saturdays from 9:30 until 1:00.
All prices are correct at time of going to press.

Call, telephone or write to:
Butel-Comco Limited,
Garrick Industrial Centre
Garrick Road, Hendon,
London NW9 6AQ.
Telephone: 01-202 0262.

BUTEL
Technology for business

● **Circle No. 138**

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback—it is your chance to keep in touch.

Business software

THE SERIES OF ARTICLES on business software by Charles Somerville were the most worthwhile that I have found in the popular computing magazines.

I now have a Superbrain, having started with a secondhand Pet to learn something of the art. My basic concept was to understand enough to obtain a management package for my consultancy practice. I did not want to use a computer for technical programs as I did not want my responsibility to rest upon somebody else's knowledge. In order to learn I found myself writing technical programs which are being "proved" for use.

The requirements of business-management packages do not seem to be met by those normally avilable and I have been advised to write the program myself. Charles Somerville's articles provide useful help — and there must be many other people in a similar situation.

R. E. Chittock,
Tadworth,
Surrey.

NEC PC-8001B

I WOULD LIKE to draw your attention to a number of inaccuracies in the review of the NEC PC-8001 — *Practical Computing*, December 1981.

There are two types of expansion unit which are available in the U.K. One is the "rather large box" which contains a seven-slot mother-board which will accept various interface cards including hard disc, etc. The other contains various interfaces but cannot be configured by the user. This by its nature has a much lower profile.

The "noisy fan" referred to in the disc unit is, in fact, the drive motor whirring. None of the NEC units requires cooling as there is sufficient ventilation to dissipate any heat produced.

Perhaps the remark about the limiting effect of only being allowed 15 files per drive implies that the reviewers did not read the manuals. If they had, they would realise that you can open up to 15 file buffers within the system. This allows any program to access information on up to 15 data files concurrently, and that would be a very large and complex program. The number of program and data files that can be stored on a disc is limited only to the capacity of the diskette itself. Therefore there is no limitation in comparison with the Pet.

I was very pleased to hear that the Hitachi monitor performed so well, but the system as supplied for review included an NEC high-resolution colour monitor. What happened to it? Unfortunately our graphic resolution is only 160 by 100 points and not as stated.

The fact that we have CP/M available was omitted from your article and that of course implies a very large software base. We will provide technical support to any software house that wishes to implement its packages on the PC-8001.

Andy Bush,
NEC Telecommunications Europe,
London NW1.

Software market

I WAS FASCINATED by the article in the November 1981 issue on modelling the software market. I think this is the first time anybody has attempted such an exercise in print.

I would, however, quarrel with the conclusion. If we are to believe the figures quoted nobody is going to make any money until 1990, which is manifestly absurd. I have been through the assumptions very carefully to see where they might be going wrong.

While I realise that you are talking about CP/M-type disc-based machines your figures for the current market base seem a trifle low. Our own estimate, based only on feel and observation of the market place, is that the base is over 300,000 machines worldwide, and that the rate of sale of such machines is about 15,000 per month. I concur with your estimate of saturation point at 11 million machines. Overall, perhaps you should clip the top eight years out of your schedule.

John Phipps,
Phipps Associates,
Epsom,
Surrey.

Speech synthesis

I WAS DISAPPOINTED in the article on speech synthesis in the November issue. For example, no mention has been made of the Computalker system which was a milestone in computer speech, introduced in 1977 with a complete machine-language driver for 8080 and S-100. Neither did the writer mention the Votrax Type-n-Talk, which costs only £275 and speaks from plain English text.

"Speakeasy" is the single most popular speech synthesiser in the U.K., suitable for absolutely any computer, and ought to have been described. Software exists for direct phonetic spelling, and the whole product costs only £69. Microspeed, though, costs an order of magnitude more.

David Sands,
Royston,
Hertfordshire.

The view from ICL

HOW NICE it is to be welcomed. The interesting editorial in the December 1981 issue of *Practical Computing* pointed out that the micro business adds up to about 5 percent of IBM's turnover. ICL's turnover is a little larger than that, but no matter — it is of the same order of magnitude as that of the micro business as a whole and very much smaller than that of our principal competitor.

To survive at all in such circumstances requires exemplary management by ordinary standards. To prosper needs superlative direction and that is just what we do now have. So perhaps we are wrong to feel included in your welcome, because we are not really big boys — indeed a great deal of our present reorientation revolves around the frank acceptance of that very fact.

We see ourselves as part of a worldwide industry which is functioning more and more like the chemical industry or the petroleum industry — buying raw materials and intermediate products wherever they are available and combining them and processing them and supporting them to meet the needs of our customers. If our customers need a particular piece of hardware or software to complete a system, and we cannot best meet it from our own resources, then we must perforce scan the world for it and ensure an adequate supply of the right item. That is how our scene is moving — though we still have some way to go before we have caught up with the older high-technology industries in this regard.

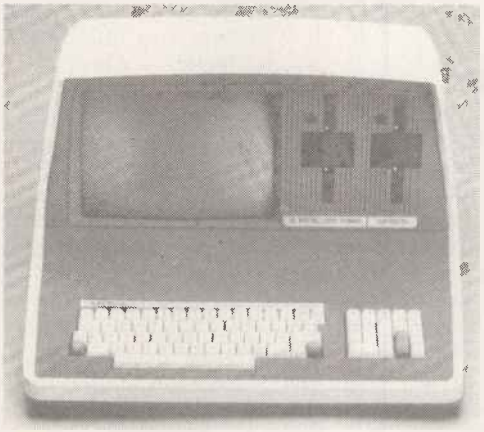
This change of point of view has two immediate consequences for ICL. On the one hand, we must not seek to rely on in-house production of components such as chips if, for volume or other reasons, these cannot be produced at world market prices. We must therefore seek alternative stable sources of supply for such basic raw material of our business. Similar considerations apply to firmware and software.

The other consequence lies at the extreme end of the long chain of productive processes stretching from raw silicon to the finished customer application

(continued on page 45)

SUPERBRAIN™

WITH DEPENDABLE SERVICE AT A SENSIBLE PRICE!



64K Dual Density Model (320K Disk) Only **£1750** (Or Lease for only **£10** per week)

64K Quad Density Model (700K Disk) Only **£2150** (Or Lease for only **£12** per week)

SUPERB BUDGET-PRICED WORD PROCESSING SYSTEM

Dual Density Model SUPERBRAIN Together with the
Dual Purpose Olympia SCRIPTA KSR Daisywheel Typewriter
and the powerful WORDSTAR Word Processing Package
For only £2,950 (Or Lease for only **£16** per week)

Full Range of Business Packages available including:

- Integrated Accounts
- Production/Stock Control
- Service Contracts Scheduling & Control
- Data Base Management
- Financial Modelling

Tailored Software designed by our professional consultants to meet your specific needs

To Order or for further Information Contact:
VISION BUSINESS SYSTEMS LTD.,
58 ST. PETER'S STREET,
ST. ALBANS, HERTS.
TEL. ST ALBANS (0727) 33744

● **Circle No. 139**

(continued from page 43)

system. The essence of successful applications development lies in achieving the right balance between "off the peg" applications and bespoke tailoring to meet particular needs.

On the one hand, there has to be a solid base of system hardware, software and applications development tools orientated towards networked systems, and that is what we can best supply. On the other hand, there is the great variety of situations encountered in each particular business. In Britain, this variety is immense and world wide it is overwhelming. Our experience with our System 10 products has conclusively demonstrated that it is the software houses who hold the key to efficient bespoke tailoring.

If we are to sell our products in the volumes required to achieve competitive prices, we have to develop entirely fresh market outlets and this also is an area in which the system houses are of crucial importance. Marketing strategy and customer applications both demand a quite different approach from that which was previously traditional in ICL.

At ICL, we believe that there will be a big part for the micro community to play in all this — especially those micro system houses with solid, in-depth knowledge of particular applications. Without this knowledge, the resulting products can fail to meet the customers' needs in quite elementary ways.

For example, a very competent but exasperated small business user has told us of a well-known micro product which only allowed four-line addresses for suppliers and of a payroll package which included the state pension scheme but not private pension schemes. Such solecisms are not tolerated by serious users.

Much of the effort of getting a worthwhile business application going involves the detailed study and appraisal of the way the business works, the way its data is structured, validated and accessed. Indeed, it is our experience that once the problems of data structure and data management have been adequately tackled, then — and only then — the programming reduces to a relatively straightforward task.

Applications development tools involving novel approaches such as non-procedural languages, artificial intelligence thinking and integrated data dictionaries and data bases are going to be essential to achieve the kind of simplicity of application which will be essential for the networked office systems of the future.

To achieve all this, all the different parts of the computer community must work together as never before and we for our part are ready, willing, experienced and determined to play our part.

Conway Berners-Lee,
ICL Corporate Communications,
London.

Reading into a Pet

I POSSESS a number of data tapes on which I have recorded temperature readings using a multi channel recorder. I want to read them out on my 32K Basic 4.0 Pet.

The information is recorded as a series of eight-bit words with a "1" as start bit.

The "1' is recorded as " ⌐ " and a "0" as " ¬ ". However, as you cannot record two consecutive ones that way, what is done is this:

where the first bit is the start bit and the rest represents a reading of 99 hex or 153 decimal.

It is recorded at about 200 bits per inch with a three-bit gap and the start bit and eight data bits. A tape speed of 1.875 inches per second gives about 375 bits per second.

Does any reader have any ideas on how I can read these tapes? It would save me having to type about 17,000 readings.

Peter Dolphin,
Petersfield,
Hampshire.

Family tree on ZX-81

I WAS very interested in Bob Merry's article "Climbing the Family Tree" that appeared in the November issue of *Practical Computing*. I am an owner of a Sinclair ZX-81 and also a genealogist, but very new to computer programming. Has anyone been able to produce a similar program for the ZX-81?

A N Little,
Farnborough,
Hampshire.

Solicitors' letters

CONTRARY TO the assertion made by the editor of *The Solicitor's Practice* — Feedback, November 1981 — word processors are eminently suitable for production of letters from a solicitors' office. A simple microcomputer with a daisywheel printer costing less than £2,500 has the following advantages:

- The solicitor need not take so much care with the dictation on tape, e.g. you tell the operator to go back higher up the page and alter one word to another, or insert a new line or paragraph — something which would make an ordinary typist resign on the spot.
- Even the smallest floppy disc will hold an average day's work with the result that every letter to be sent out may be saved magnetically, at least for the day. Alterations may be made at the end of the day in a minute or two.
- Formal parts of each day's letters such as the date, the solicitor's reference and any other messages which may have to go on every letter — such as an additional partner's name or a change of address since the last printing of note headings — may be printed automatically on each letter.
- The typist does not need to retype long names and addresses for the envelope. They may be printed from the text of the letter.
- The names and addresses of regular correspondents may be saved on a disc and added automatically to appropriate letters.

The same machine can cope with drafts and engrossments, as well as probate affidavits and forms — despite the remarks of the learned editor of *The Solicitor's Practice*. With the assistance of VisiCalc it will deal with every aspect of the accounts, bills and time costing of any solicitor who is already familiar with the single-entry type of book-keeping.

For the litigation solicitor, the microcomputer can easily be programmed by anyone with even such lowly qualification as myself — School Certificate maths, failed — to cope with taxed bills.

Vincent Hale,
Sheffield,
South Yorkshire.

Your experiences, please

I AM CARRYING OUT research into applications of microcomputers to small businesses, especially the problems of the first-time user. I would be interested in making contact with any small businesses who have used micros, as well as consultants and anyone else doing research in this field.

Frank Blewitt,
Department of Accounting and Adminstrative Studies,
Polytechnic of North London,
London N7 8DB.

Extra Qume characters

THE ASCII CODE only allows for direct code access to 94 printable characters, and most keyboards used in microprocessor systems allow you to directly access, at the most, 92 characters — far fewer than this on some systems. All systems, however, can tansmit all of the 94 printable characters.

To print the two extra characters on Qume 96-character printwheels, however, it is necessary to transmit a two-character string to get each character to print. To print the character in printwheel position 002, the system needs to transmit ESC/; the character in position 004 is accessed by transmitting ESC SP.

R D Taylor,
Qume (U.K.) Limited,
Reading,
Berkshire.

Teledek update

UNFORTUNATELY the information given on the Teledek 2000 in "Adapt to Choice", October 1981 issue, was out of date. Zycor has recently moved from London and the new address is: Gateway House, 302/308 High Street, Slough SL1 1NB. Telephone: Slough (0753) 79127.

The current price of the Teledek 2000 is £225.

B A Price,
Zycor Ltd,
Slough,
Buckinghamshire.

Twin-processor Torch may be leading light

THE TORCH COMMUNICATOR is a new British computer that combines both the Z-80 and 6502 microprocessors in the same machine. The twin-processor machine has 96K of user memory together with powerful communications and network facilities. The basic machine is capable of handling Telex, Prestel and teletext, connecting directly to a dial-up telephone line. A built-in Modem services a direct 120cps telephone communicator.

Messages can be received without interrupting the current operating mode. The user is informed that a message is being received by the screen; it is then stored until it is either called up and converted into hard copy or is sent to another station on the Econet network. It takes a mere 10 seconds to send a full screen of information to any destination in the world.

On-line backing storage of 1Mbyte is provided by the twin 5.25in. double-density mini-floppy disc unit. There is also a hard-disc option providing a maximum of 10Mbyte of on-line storage. The 80-column VDU is capable of providing high-resolution colour graphics, together with a teletext mode.

The graphics capability is greatly enhanced by the twin processor. One processor can operate all the disc-handling

functions while the other is sorting data.

The popular CP/M operating system opens up a vast library of tried and tested software to the user, including the ubiquitous VisiCalc and various standard accounting packages. All of them are, of course, fully integrated.

A word-processing system which is fully integrated with the communications software allows letters to be typed, edited and speeded to their destination without the users ever leaving their seats. Languages include the popular Microsoft Basic, the currently fashionable BBC Basic. Pascal, Fortran, Cobol, Algol 68, Lisp. Forth and C.

The Communicator is a joint manufacturing venture between two British companies: Acorn Computer, the manufacturer of the powerful Atom and the BBC Microcomputer, has collaborated with the Climar Group. Acorn provides the hardware expertise gained during development of the Atom, the BBC Micro and the successful Econet. Experience in business software is Climar's contribution.

The machine is entering a highly-competitive part of the market and, as a Torch spokesman pointed out, the machine is only half the price of the IBM equivalent. The Torch Communicator retails at £2.500 and will be manufactured in the U.K.

Pascal learnt by video

A VIDEO SERIES called Programming in Pascal consists of 16 half-hour programmes which teach this structured language to users with no previous experience.

At £1,250 plus VAT the tapes are no snip, but educational establishments will be able to purchase the series at a discount. The pace is slow at first but picks up momentum once the basic concepts have been tackled.

For more details contact the publishers, John Wiley and Sons, Baffins Lane, Chichester, West Sussex.

The Welsh connection

IF YOU NEED to run a program that calculates the revenue of this year's leek harvest, or if you want to run a stock-control program for your daffodil plantation, why not program in Basicym? If your programs Rhed rather than Run, and Llwy instead of Load, then you are probably a Welsh programmer and will find Basicym a boon — it is a version of Applesoft Basic in the Welsh language.

All Applesoft and DOS commands, the error messages and the relevant single-letter suffixes are all in Welsh. So, a syntax error becomes *gwall iaith,* and should you see *gorchymyn anyniongyrchol,* then all that is wrong is that it is not a direct command.

The language system has been written for a minimum configuration Apple with one disc drive and the language card — not the Welsh one — is available from Cardiff Micro-Computers, 46 Charles Street, Cardiff, South Glamorgan. Telephone: 0222 373072.

Form a model balance sheet

MULTI-PLAN is a new software package designed for financial modelling. Income statements, balance sheet and cash flow can be produced for given inputs of production units.

Multi-Plan is available from Keating Computer. 42 Knoll-Back Avenue, Brampton, Barnsley, South Yorkshire.

Building a network of Pets with multi-headed Hydra

THE LEGENDARY HYDRA was a many-headed beast; its electronic namesake has the same characteristic, the heads being Commodore Pet microcomputers. Networking systems are all the rage these days: inter-micro communication is only one of many facilities provided by such a network. Up to 255 items can be connected to Hydra, enabling users to share disc drives, printer devices, etc with obvious financial savings.

Hydra itself comprises a

small board which plugs into the Pet memory expansion port, together with some software in ROM. Installation is simple and it is available for the 3000, 4000 and 8000 Pets. The total length of the network can be up to one kilometre; four-way screen wire must be provided by the user.

Seven extra commands are provided in Basic, and facilities to restrict access to nominated drives are included. Hydra costs £125 plus VAT for each Pet in the system, and comes with a comprehensive manual. For details contact Wordcraft Systems, 9 Littleover Lane, Derby.

More fluent flowcharting

FLOWCHARTING is an important stage in the development of software intended for serious use.

Rather than sit for hours with pencils, pencil sharpeners rubbers and reams of paper drawing flowcharts, programmers at Data Communication Ltd produced the idea of the flowchart planner.

The workboard and a complete set of symbols sells for £21.97 plus £1.75 postage and packing from Flowchart Systems. 01-942 2830.

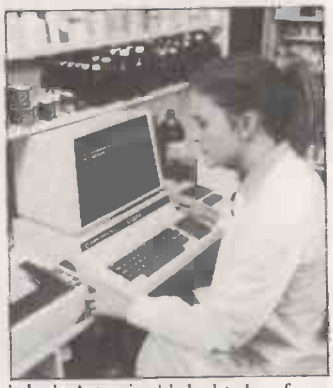
Chemists' Pet prints message on a bottle

PRESCRIPTION LABELLING is a task that readily lends itself to computerisation. It is a boring, tedious job but the consequences of not doing it correctly could be disastrous. Pals — the Prescription Automatic Labelling System — is an applications package that performs the job on the Commodore Pet microcomputer.

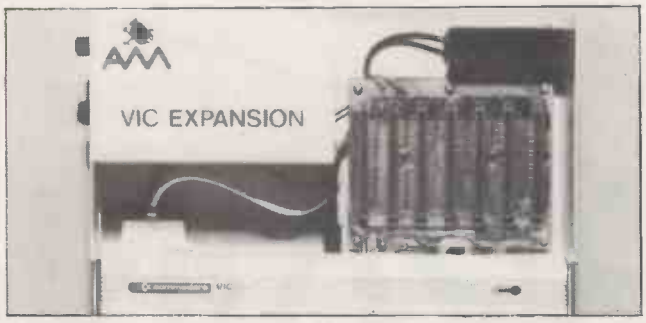
A prescription is normally dispensed and labelled manually, which is inefficient and expensive in manpower. A further problem is that quality tends to deteriorate as pressure increases during peak dispensing periods. The label is the last link between the patient and the doctor, so clarity is essential. Research indicates that printed instructions are more likely to be followed correctly and completely. Pals provides labels with similar quality to typewritten labels at a higher speed.

The system runs on the Commodore Pet computer, together with a tape drive and the Epson printer. The end-user price for the system is £1,495, which includes installation and some training, plus 12 months' maintenance on a same-day-service basis with an initial supply of pre-printed labels and plain printer stationery.

The system comes with a number of standard products and dosage instructions, all of which can be reprogrammed using the computer. Any standard item can be overwritten to produce a non-standard label. A typical label takes four seconds to print, rising to seven seconds when combinations of standard drugs and doses are mixed. The patient's name is entered only once, regardless of the number of items dispensed. There is an inbuilt tutorial routine to familiarise the user.



Pals is available from Taylor-Wilson Systems, Oakfield House, Station Road, Solihull, West Midlands. Telephone: (05645) 6192.



This Vic-20 microcomputer is fitted with the Arfon Vic Expansion unit, a device which greatly extends the possibilities of the computer. The unit contains a power supply which can cope with the extra power requirements of the expansion, contained in the safe enclosure at the top left-hand corner of the picture. To the right is a seven-slot expansion motherboard, behind which is a holder for the modulator. The existing port for joystick, paddle or light pen remains free, as do the cassette and disc-drive ports. The motherboard accepts memory, program ROMS or functional units. For further information contact Arfon Microelectronics. Telephone: Caernarfon (0286) 5005.

Tandy display improved

TRS-80 MODEL I owners can improve their video displays with the AV-1 board from RHA (Minisystems). A total of 96 ASCII characters are added to provide the scripsit-compatible lower case. The board enables characters to be displayed white on black or black on white. The graphic character set is retained to give a total of 256 characters. The whole screen can be inverted under separate control.

All the functions are totally software-compatible with the existing TRS-80 software, and the board does not affect the operation of the cassette unit. It contains seven chips and is supplied, assembled and tested.

The unit fits inside the keyboard case. Some tracks must be cut and some soldering done; there is a fitting service which costs an extra £10. The kit costs £23 plus VAT; for other prices and further details contact RHA (Minisystems), 83 Gidley Way, Horspath, Oxford OX9 1TQ.

Attractive properties for estate agents

ALPHA ESTATES is a new business system specially for estate agents which takes into account all aspects of this volatile market. The software runs on the Adler Alphatronic microcomputer and was developed by John Elmer, an Alphatronics systems house, in collaboration with regional estate agencies.

Operators need no prior knowledge of computing to use the system, as clear instructions in plain English guide the user. Alpha Estates will perform the creation and amendment of property records, the creation and amendment of applicant records, matching of properties to applicants, and selection of applicants for the mailing of new property details. It provides full details and summary reports for office use.

There are customised coding facilities to meet agents' requirements, automatic production of mailing labels, on-the-spot printing of properties suiting applicants' needs. Full instructions are included, together with sample files and documentation and sub-agents property print for easy updating.

Searches can operate across four criteria — type of house, price, number of bedrooms, etc. — and can then be broken down by further criteria. A search takes about four seconds. Other search factors increase the efficiency of the office, for example by providing a list of all houses not sold after a given period. Advertising effectiveness can be analysed to help the company to maximise results.

As well as the estate agent's system, word-processing and accounting software can also be purchased; a property management system will follow shortly.

The package costs £525 and is available from Triumph Adler U.K., Alphatronics Division, 27 Goswell Road, London EC1M 7AJ. Telephone: 01-250 1717.

TODAY'S BEST PRICE PERFORMANCE RATIO FROM A MICRO COMPUTER FROM

£1875

Standard Model 64K RAM/320K DISK

ALTERNATIVE MODEL:
'QD' 700K DISK £2150

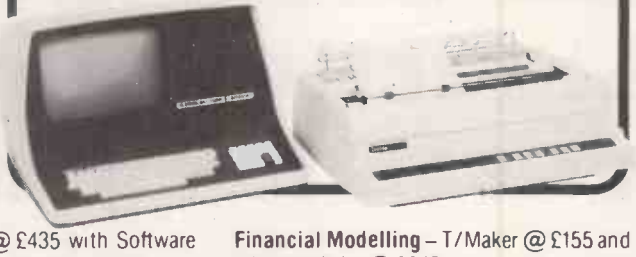
SUPERBRAIN

MASSIVE DATA STORAGE FROM HARD DISK

Massive storage capability is available with the 8in. Winchester Micropolis 7MB – 35B Hard Disk from £3500 including a controller to connect directly to your Superbrain.
12 month warranty included in price.

WORDPROCESSING SYSTEMS

A complete wordprocessing system including 'Word Star' and 'Mailmerge', standard Superbrain, Diablo 630 printer, training and up to a day's installation for around £3850.



Software Options: we market a full supporting range of standard languages, including, BASIC @ £175, FORTRAN @ £225, PASCAL @ £225, and CIS COBOL @ £425. We have a growing and comprehensive library of software programmes available:

Incomplete Records for Practising Accountants @ £750

Graphics – Hardware @ £435 with Software from £80

Integrated Accounting System – Stock Control @ £350, Order Entry and Invoicing @ £350, Sales Ledger @ £450, Purchase Ledger @ £450, General/Nominal @ £400, Name & Address @ £250. Complete Package so far @ £1650 plus Payroll @ £500.

Financial Modelling – T/Maker @ £155 and Micromodeller @ £645.
Data Base Management –DMS @ £400
Word Processing – Wordstar @ £250 and Mailmerge @ £75.
Also available – Form Creation, Debugging etc.. Alternatively we will design and implement software packages to suit your specific needs.

KGB MICROS LIMITED

KGB Micros Ltd., 14 Windsor Road, Slough, Berks. SL1 2EJ Tel: Slough 38581

Prices exclude V A T and are subject to fluctuation please phone for an up-to-the-minute quote

● Circle No. 140

The Iona is a stylish eight-bit microcomputer which combines keyboard, main circuit board and power supply in a metal, semi-portable desk-top case. Memory can be expanded all the way up to 960K. Accessories include both a colour and a monochrome monitor, 5.25in. mini-floppies and a matrix colour printer. A full range of CP/M systems software is provided, and a dealer network is being set up. For details contact IOTEC, 4 Playhouse Yard, Blackfriars Lane, London EC4V 5EX. Telephone: 01-236 7968.

How to keep the 380-Z at a distance

USING THE RK-100T or RK-100R, a school can adapt the Research Machines 380-Z microcomputer to operate from a number of remote terminals. This facility allows terminals to be set as and where they are needed while the computer itself is kept at the most convenient location. Terminals can be sited in science labs, classrooms or the administration offices — in fact anywhere up to 500 metres from the main processor.

Though the ability to do this is not new, the remarkable feature of this implementation is that the links are made without recourse to expensive 15-core cable. These units from Robots Unlimited use only two-core cable. Video or TV signals are transmitted by the normal video-cable network. The system will therefore be of particular use to those educational establishments already using a video link.

Contact Robots Unlimited for further information at 1 Denbigh Road, Luton, Bedfordshire. Telephone: Luton (0582) 507838.

Free Apple II brochures

APPLE COMPUTER (U.K.) has published a series of glossy colour brochures for the popular Apple II microcomputer. The five separate booklets, available free on request, have been written to enable enquirers to obtain initial information about Apples.

The booklets in the range are: Apple at a Glance, Apple in Business, Apple in Industry and Science, Apple in Education, and Apple has the Answers. Write to Apple Computer (U.K.), Finway Road, Hemel Hempstead, Hertfordshire.

Group boosts micros in primary schools

MICROCOMPUTERS and Primary Education is a non-profitmaking association of practising teachers which provides members with specialised help. The organisation aims to co-ordinate and initiate ventures into microcomputing by teachers of younger children. All affiliated schools receive the information pack, which is paid for by the central government and produced by the MEP project.

Members have access to a library of educational software, and are offered preferential insurance terms. Regular newsletters inform participating schools on various aspects of the microcomputer world. Mape, as the organisation is known, also provides primary teachers with a united voice and has been consulted by central government representatives on important issues.

In the light of the Government's decision to provide backing for microcomputers in primary schools, Mape is prepared for a massive response to an appeal for members among the 250,000 primary-school teachers. Membership of Mape costs £7.50 per school. For further information contact the secretary, Barry Holmes, St Helen's County Primary School, Bluntisham, Cambridgeshire; a stamped, addressed envelope will be appreciated.

Primary-school teachers will also be interested to hear of the second conference of teachers involved in microcomputing which will be held at Exeter University at Easter. For further details and bookings, contact Roy Garland, College of Education, St Lukes, University of Exeter, Exeter, Devon.

Accounting to taste

AIRS stands for Accountants' Incomplete Records System, a modular package which may be expanded to meet particular requirements. Basic modules allow the user to prepare a cash and bank analysis with reconciliation.

The package costs £975 and can be purchased from MSS, 54 Chapel Road, Worthing, West Sussex. Telephone: Worthing (0903) 34755/6.

Speed-and-power theory of British Quantum

TWIN Z-80A PROCESSORS AND triple quad-density floppy drives make the new Quantum 2000 no ordinary microcomputer. However, this British-built machine would appear to be remarkable value at only £2,250 plus VAT. Internally the computer lives on a series of 8in.-by-8in. boards, making for easy servicing. Four empty slots leave room for expansion.

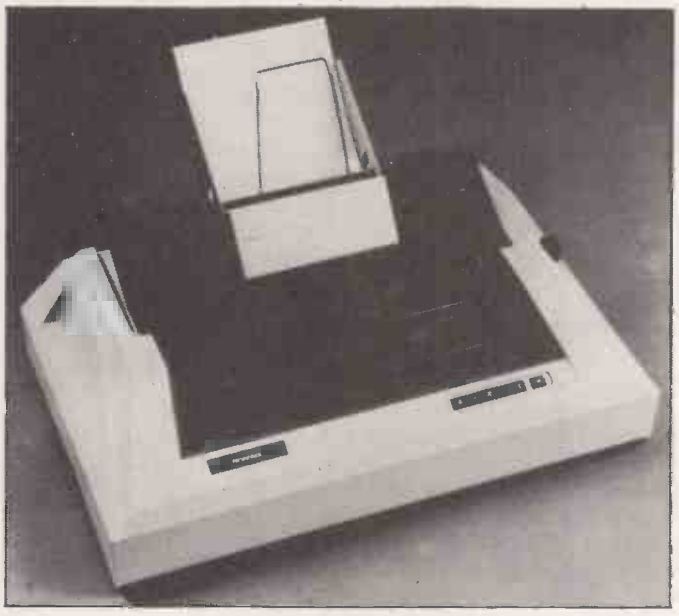
The basic system uses the two processors and the British-originated 80-bus standard to provide an unusually fast machine. Its advantages will be most strongly felt in the multi-user system. The triple quad-density mini-floppies offer a total of 2.1Mbyte of on-line storage in addition to the 64K user RAM available in the micro itself.

A 12in. green screen monitor is an integral part of the system and displays 80 by 25 characters mapped to the user RAM. A programmable character generator produces 128 graphics characters including pixel combinations. The built-in ASCII keyboard has a 128-character buffer and 16 special-function keys, as well as a numeric keypad.

For more details contact the manufacturer, Quantum Micros, 60/62 Balcony Unit, Merrion Centre, Leeds, West Yorkshire. Telephone: Leeds (0532) 45877.

Advanced Anadex makes its impact

MANUFACTURERS are understandably enthusiastic about their products, but the WP-6000 printer may well live up to claims that it is the most advanced impact matrix printer. The 18-wire print head and the high-speed, bi-directional, logic-seeking servo system enable the machine to print correspondence-quality text at over 150 cps. In the rough-draft or data-processing modes, the speed can rise to over 500 cps.



Multiple resident character founts and optional downloading of other founts from a host computer are provided along with proportional-spacing and text-justification features. The scientific fount will be welcomed by the scientific and engineering communities; Greek letters are available in both upper and lower case.

Contact Anadex, Weaver House, Station Road, Hook, Basingstoke, Hampshire. Telephone: Hook (025672) 3401.

Low-cost Camp cuts surveyors' paperwork

QUANTITY SURVEYORS, consulting engineers and contractors will find Camp an attractive software package. The Contract Account and Measurement Program provides a low-cost facility for producing bills of quantity under all conditions of use.

Tender documents, interim valuations and forecasting are integral parts of the program. Price fluctuations can be carried out for Baxter, BEAMA, NEDO Series 2 building works, and NEDO Series 2 specialist engineering works.

The software runs on the Hewlett Packard-85 machine, with twin disc drive and printer. By using the HP-85 with integral cartridge, interim evaluations can be undertaken at site offices. For further details contact Civil and Structural Computing, Ash Court, 2 Ash Grove, Great Horton Road, Bradford BD7 1BN. Telephone: Bradford (0274) 391706.

The special flake-proof oxide coating of the Inmac Plus flexible disc gives software a lifetime's protection. Each disc is individually numbered and will be replaced if a fault occurs. Both standard and mini-floppy discs are available. The 5.25in. discs cost £4.10, and the 8in. discs £5.95. Inmac can supply any U.K. destination within two days, Europe takes a little longer. Contact Inmac on 09285 67551.

New courses of action

A COURSE to provide managers with training in the uses and applications of VisiCalc is just what the doctor ordered. Provided by IMCL, and supported by *Practical Computing*, the course promises to acquaint executives with powerful and affordable technology. There will be plenty of opportunity for hands-on experience.

IMCL also offers a two-day course in basic programming entitled Not so Basic Basic, again supported by *Practical Computing*. The aim of the course is to take managers from an elementary level to a standard where they can write their own business software. Contact the Conference Registrar, IMCL, 197 Knightsbridge, London, SW7 1RN.

Variety of formats on bi-directional Facit

THE FACIT 4526 bi-directional printer costs £1,050. It offers 132 characters per line and a print speed of 150 characters per second. The 9-by-9 dot matrix, with true descenders, can produce a variety of character sets in addition to ASCII.

A wide range of formats and printing modes is available, including hex trace. The printer uses minimum-distance sensing logic to ensure economy and speed of printing. The 4525, an 80-column version, is available at £938. For details contact Hi-Tek Distribution, Trafalgar Way, Bar Hill, Cambridge. Telephone: (0954) 81996.

Naming successor to The Last One

IT SEEMS that The Last One was poorly named; it was in fact only one in a string of program generators. The latest to come to our attention is an ingenious piece of software called the Program Writer/Reporter. It writes complete, running and debugged Basic programs that are fully documented and easily modified by the user.

The originators claim that users with no previous experience will be able to write their own programs within the hour, and that experienced programmers will be able to save up to 90 percent of their time. There are four versions of the program available: Apple II, Apple III, Apple CP/M and standard CP/M. Prices range from £220 to £260. The program, distributed by a nationwide network of dealers, is also available from Apple Computer and Taunton Electronics. Telephone: Taunton (0823) 433142 — 24-hour answering service.

● Circle No. 141 ▶

First time on Earth.

SHARP
MZ-80B

Sharp bring you the MZ80B. A machine that offers you functions previously only associated with more powerful, more expensive computers; that gives you versatility to handle a huge range of software and hardware applications in scientific, business and personal use.

The MZ80B opens up a new world of graphic display potential, more flexible data storage and retrieval, and ease of operation.

Here is the computer from the future. Available today.

Stunning Graphic Display.

Seeing is believing. The large-screen, high-focus, green-face display incorporated in the MZ80B gives you high-resolution graphics of 320 x 200 dots.

An additional graphic RAM can be added which allows another 320 x 200 dot resolution pattern to be displayed.

This dual high-resolution graphic ability is especially useful for simulating and displaying a dynamic picture. It can display 40 characters x 25 lines or 80 characters x 25 lines via software switching.

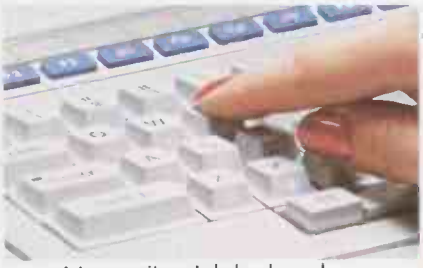
In addition there are facilities for full, on-screen editing, reverse video, partial scrolling and a full range of graphic symbols.

Character and Graphic Printer.

This fast, quiet printer will reproduce your graphic displays and, of course, print-out upper and lower case letters and symbols. A tractor/friction feed version is also available.

Data Storage/retrieval.

The MZ80B has a remarkable memory. 64K of RAM. And that constitutes all the memory area, giving flexible storage of any computer language and its software. The cassette deck is electromagnetically-controlled, with a data transfer speed of 1800 bits/sec combined with a unique programme search facility to make data storage and retrieval super-fast.



A typewriter-style keyboard incorporates characters and symbols plus a numeric key-pad and ten user-definable keys for fast and simple operation.

BASIC is, of course, provided with Z-80 Assembler Packages, PASCAL and a BASIC compiler.

Floppy Disk Drive.

A twin Floppy Disk Drive unit can be added which will give you 560 bytes of storage on double-sided, double-density disks.

Comprehensive Documentation.

Each MZ80B comes complete with a full set of documentation including an owners' manual giving full circuit diagrams, a monitor reference manual and programming manuals.

Interfaces

RS-232C and IEEE Interfaces are available from January 1982 allowing the MZ80B to communicate with scientific instruments and other peripherals.

CP/M*2.2

CP/M* is also available making a wide range of packages immediately available including wordprocessing, financial modelling, data base management to mention but a few. CP/M* also increases the disk capacity to 680K.

(CP/M* is a Trade Mark of Digital Research Ltd).

SHARP
First, and foremost

SHARP ELECTRONICS (UK) LTD., COMPUTER DIVISION, SHARP HOUSE, THORP RD., NEWTON HEATH, MANCHESTER M10 9BE. TELEPHONE: 061-205 2333.

Why on Earth don't you find out more?

Please send me full information on the Sharp MZ80B computer.

PC 3/82

Name

Address

Tel:

To: Sharp Electronics (UK) Ltd., Computer Division, Sharp House, Thorp Road, Newton Heath, Manchester M10 9BE. Telephone 061-205 2333.

64 K bytes* in every bar

Hi-tech Electronics' new Processor and Memory (PAM for short) is a complete Z80 computer on a single board, fully compatible with North Star and Comart Communicator software. Features include a Z80A processor *and* 64 K bytes of RAM (with bank and 8 K block disable + phantom) 2 K of 'ghosted' EPROM and monitor (extendable to 8 K) two RS232C serial ports and a parallel port.

*and a Z80A processor!

All this on a single S100 board at a best-ever price of

£295 + VAT

Access

To order your PAM *now*, phone or write to:

HI·TECH ELECTRONICS
54 HIGH ROAD, SWAYTHLING, SOUTHAMPTON SO2 2JF
TEL 0703 581555 TELEX NO. 47388 HTEL

Micros for business and the consumer

MICRO-C is the microcomputer division of the Curry's High Street electrical retailer. Better known as a purveyor of more conventional electrical goods, Curry's now markets a selection of 12 systems ranging from relatively small games machines to large, all-singing, all-dancing business systems. In addition there is a comprehensive support network for both hardware and software, and there lies the strength of Curry's brave foray into microcomputing.

The national retailing chains are keeping a canny eye on the potentially lucrative microcomputer market. Bill Bennett visited one which has already taken the plunge, and reports on how it is faring.

Birmingham was the first and, together with Leeds, is the most successful Micro-C branch. It is to be found tucked away near the back of Curry's huge city-centre showroom beyond the rows of televisions, refrigerators and washing machines. This shop-within-a-shop is reminiscent of those esoteric little departments in Harrods or Selfridges, an oasis for the enthused.

Micro-C subscribes to a philosophy which is becoming increasingly popular with microcomputer dealers — dealers, that is, as opposed to retailers. A Micro-C branch is not merely a shop where customers walk in with bulging wallets and leave with a box full of silicon chips. For the staff at one of these branches the real work begins once the system has been bought.

Sizeable staff

The Birmingham branch has a sizeable staff led by Mike Griffin, who has been with Micro-C since its inception two years ago. He knows more about the sharp end of the business than most. Together with Carol Weaver, the branch software expert, and Tony Gwalchmai the salesman, they furnished me with the answers to my questions.

How does Micro-C operate? It all starts before the customer becomes involved, with experienced staff conducting rigorous tests on all equipment before it is put on the Micro-C list. Only equipment on this list is supported, but inclusion means the hardware and software is of a high standard. As soon as a prospective user has made a decision to purchase a micro, Micro-C staff can provide advice and demonstrations.

Once the relevant hardware and software has been selected, a Micro-C representative visits the prospective user's site. Tony Gwalchmai considers that this is one of the more important jobs after the feasibility study, because once the equipment has been ordered, the user must find somewhere suitable to put it. "It is surprising, but many customers believe that all they need is a single power point and that's it". He then went on to reveal that customers are taken aback when they discover that a Pet computer, a disc unit and a printer each require a power socket; in the case of the Apple II an extra point is required for the monitor.

The next stage of the process takes place when the truck carrying the equipment arrives at the branch. Once unloaded, the relevant machine is connected up and checked. Only when the system has been proved does the scene shift back to the customer's office as the system is reassembled by the Micro-C representative.

The supervised installation of a system is essential. Some might scoff, but to the inexperienced all those connecting wires are just so much spaghetti. At this stage the sales team can take a breather, or make another sale, because the support people take over. Carol Weaver is responsible for ensuring that the users can operate the software packages that they have bought. A customer buying a new system together with some software is given two days training free of charge.

Weaver often finds that the people who will be operating the microcomputer have no idea about what it can or cannot do, and are absolutely clueless when it comes to making the beast work. The two days' training cannot be taken all at once. Not all the information is assimilated anyway, but small doses help to make it more digestible so sessions usually last half a day or less.

The economics of the training scheme are quite simple. A complete computer system costs around £2,000 and Curry's offers few discounts. The training is loosely structured, starting with a short session on how the hardware works and progressing to disc handling and practice sessions with dummy data. Weaver never lets users go live with their own data until she feels they are safe.

The longer term

Over the longer term, Curry's makes available post-sales support and Carol Weaver will follow up any phone calls requiring help. Customers can also buy further training if they wish, though this option has yet to be taken up. Buyers of one of the smallish software package, such as VisiCalc, are entitled to about half a day of supplementary training as well as the initial two days.

Micro-C recognises that it cannot expect to supply all its customers' needs. Tony Gwalchmai reasons that there is a wide enough range of software on the Micro-C lists for most users, but there will always be some esoteric applications for which they will look elsewhere. Using software which has been bought from other sources does not affect the 12-month guarantee on the hardware parts and labour, nor does the addition of approved peripherals. Service within 24 hours can be assured for an extra charge.

Prudent buyers take up the option of a service contract at the time they buy the initial system. There are three levels of service; ordinary, 24-hour, and preventive maintenance. Ordinary service costs about 10 percent of the equipment cost — a little extra for printers and other service levels.

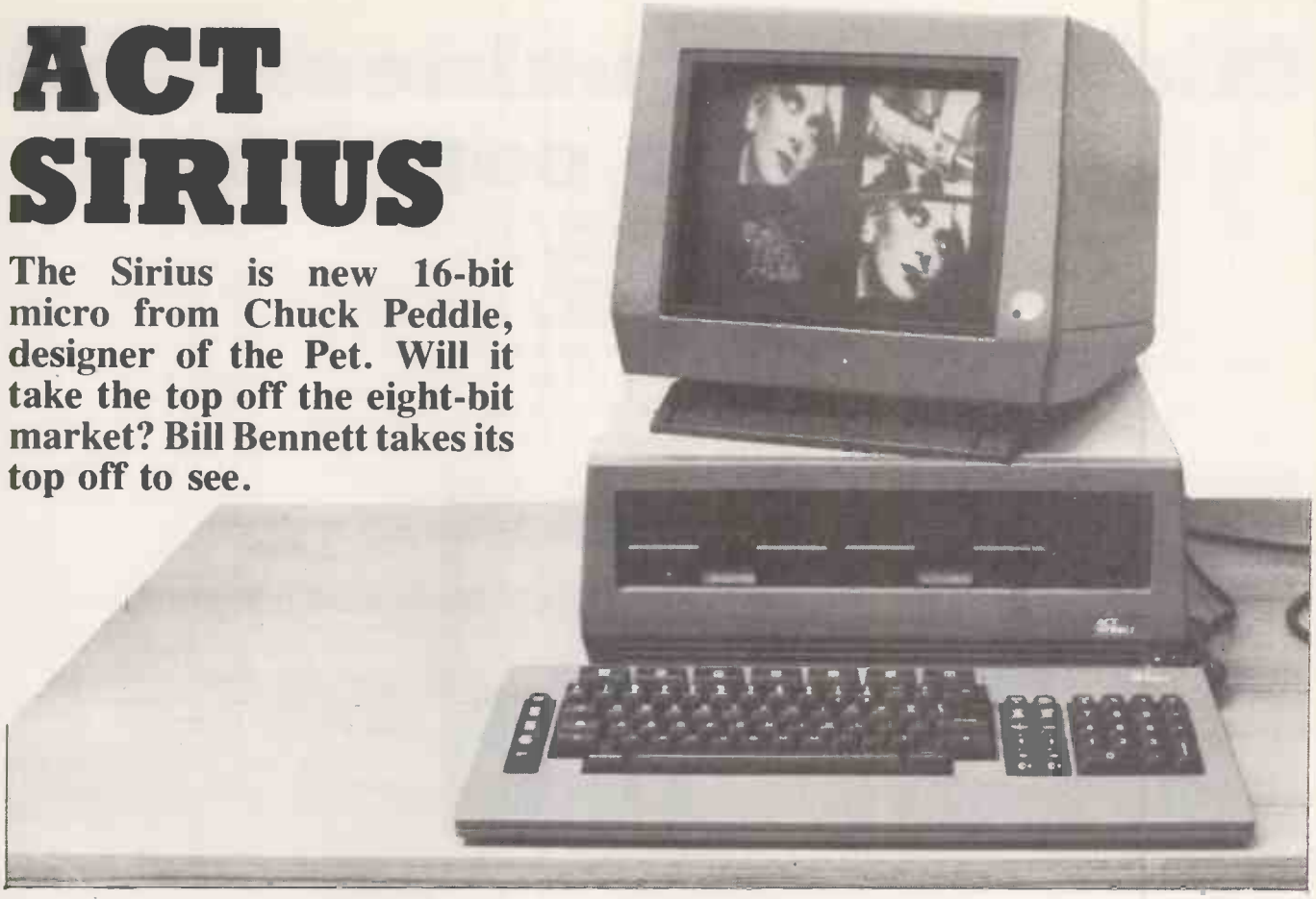
The question remains, how successful is the Micro-C approach? There are no precedents on which to form a judgement, though the staff at Birmingham are all sure that they are on the right lines, and within two years Micro-C has expanded from one branch to nine.

At the present each of the two Birmingham field salesmen sells, on average, one complete business system a week. This number is sure to increase as past customers return for more machines and the branch's reputation becomes known.

● Circle No. 142

ACT SIRIUS

The Sirius is new 16-bit micro from Chuck Peddle, designer of the Pet. Will it take the top off the eight-bit market? Bill Bennett takes its top off to see.



THE ACT SIRIUS is the latest episode in the short but action-packed history of micros. The designer of the system, American Chuck Peddle, has already reserved his place in microcomputing history — he is the originator of the world-famous 6502 microprocessor and the one-time best-selling micro in the U.K., the Commodore Pet.

There are many critics of the Pet, but for all its faults that venerable old war-horse of a micro has kept millions of satisfied customers happy for years and continues to do so. The key to the Pet's success was that for one initial outlay a would-be computer user could buy a complete, self-contained system.

Air of confidence

In those days it was most unusual to find a microcomputer which you could plug in, switch on and start computing immediately. Originally, Pets were supplied with the keyboard, processor, screen and cassette drive all in one case at one price — a neat package with no extras to buy or trailing wires.

The Sirius — or the ACT Sirius to give the machine its full U.K. title — bears no resemblance to the Pet. The smart good looks of the Sirius — so important in desk-top computing where the executive image must be maintained at all times — places the Sirius far from the ugly utility of the Pet. Ergonomic to a fault, the Sirius has an air of lofty confidence about it — even when the power is off.

There is, however, one common thread between the ancient and modern; they are both complete in themselves. The system specification of the Sirius reads like next year's fashions in desk-top computing. Everything that the man who has everything could ever need — in one package.

Obviously this machine has been developed for the business user. The keyboard has all the conventional keys and more. To be pedantic, it "features an IBM Selectric-style nucleus with an additional range of special-function keys". The screen has the highest-resolution imaginable on a machine of this size, and the memory is an ample 128K of user RAM — which can be extended internally to 0.5MB and externally to 1MB.

The system supplied for review was one of the first to enter the U.K. By the time ACT starts installing the machines in volume, the manuals will have been written. For the purposes of the review I was furnished with a set of photocopied notes. Even these notes seemed comprehensive, there was little missing, and some manufacturers supply far worse documentation with production-model machines.

When the machine arrived, I was treated to a short display of its powers. I was highly impressed, despite the fact that the micro insists on saying "I am the Sirius 1, the number one choice in personal computers", every time it is switched on.

I realise that when a machine is being demonstrated by somebody whose very livelihood depends on it, it is difficult to make objective judgements. I decided to commit to memory all the impressive things I had been shown and see if I could re-create them later. The high-resolution graphics were probably the greatest revelation. Not only is the resolution extremely good for a small machine, but the pictures can be called quickly — the product of its 16-bit processor and mammoth memory.

One other interesting point I discovered during this short demonstration was that the whole system is software-driven. By that, I mean that apart from the boot-up routines which are in PROM, all else is down-loaded from disc — even the character founts. This gives the Sirius a flexibility that other microcomputers simply do not possess. Various character founts can be loaded at will and the definition of the function keys can be changed; in fact there is total flexibility.

Operating system choice

Although the Sirius can work under the new IBM personal operating system, the review machine had a version of Digital Research CP/M called CP/M-86. In fact in the immediate future, ACT expects CP/M-86 to be the more popular choice, because of its similarity to CP/M rather than to the IBM operating system.

However all the indications are that the IBM system is set to take the personal computing world by storm. My own feelings are that it hinges on two matters: one, whether the IBM Personal Computer actually makes its mark and two, whether the applications, software written under

the system is of a sufficiently high quality.

On the surface, CP/M-86 is very much the same as CP/M on any other machine. It differs because it was written for the Intel 8086 processor. The Sirius microcomputer does not use the 8086; it uses the Intel 8088 chip. This may seem unusual until you discover that the 8088 has exactly the same instruction set as its sister, the 8086. The difference between the two is that although they are both 16-bit processors internally, the 8088 is designed so it can interface to the eight-bit microcomputer world.

Technical Specification
Processor: the Intel 8088 16-bit chip.
Memory: 126K standard, expandable to 1MB.
Disc capacity: 1.2MB to 10MB. Twin mini-floppies standard.
Operating systems: CP/M-86, MDOS.
Keyboard: 97 keys, Selectric nucleus, separate numeric pad.
Screen: 11in. display in swivel mounting. Colour display optional.
Sound: Codex speech generation and storage.
Languages: Microsoft Basic, compiled Basic, Cobol, Pascal, Fortran.
Price: £2,395.

CP/M commands retained

To the user, CP/M-86 is the same as CP/M on eight-bit machines, it still uses the same commands. There is still the same A > prompt to tell which disc you are using. Dir works in the same way, if you type a file it appears in the same way and it even spots errors in the same way. Of course, all the bad aspects of CP/M have also been retained. If you were considering buying a Sirius, CP/M might be a problem for you if you have never met it before.

As an in-depth look at CP/M-86 will only really be of use to the professional programmer, I shall cover it only briefly here. If you want to know more, I suggest you read *CP/M Programmers' Guide* and *CP/M System Guide* which are both written by Digital Research.

Sirius CP/M-86 is a control program, for a disc-based personal microcomputer. It provides the necessary tools for the writing, storing, editing and documentation of programs. In addition, it provides an assembler and a debugging aid. In this much it is the same as CP/M. The difference lies in the assembly facilities which are for the 8086 assembly code, as are the dynamic test and debug program and not for Z-80 as conventional CP/M. The list of recognisable file types under CP/M-86 are:

A86 8086 assembly-language source code.
BAK Back-up file created by Ed — the text editor.
BAS Basic source code.
CMD Executable command file.
COB Cobal Source code.
DAT Data file.
FOR Fortran source code.
H86 Intel-format hexadecimal file.
INT Intermediate compiled code.
LST Listing of compilation or assembly.
OVR Overlay module.
PRN Listing of compilation or assembly.
REL Relocatable object-code module.
SUB Command file executed by Submit command.
SYM Symbol table of assembly.
XRF Cross-reference of absolute assembly.
$$$ Temporary, system-generated file.

CP/M-86 is included on the Sirius system disc. It automatically boots itself when the disc is inserted in the left-hand drive and when the drive door has been closed. On the review system there was no prompt for this until a disc was inserted. All that the screen showed was an identification message. On production models of the system there is a visual prompt which appears on the screen to tell the user to insert the systems disc.

Also included on the Sirius system disc are some general software packages. ASM86.CMD which is the 8086 assembler; DDT86.CMD the dynamic debugging tool; DCopy a program which copies the source disc to the destination disc, destroying everything on that destination disc; ED.CMD the text editor, which is used to create and edit text files.

ED.CMD however is not the best of text editors — if you have a good deal of text editing to do, buy a word processor. Format.CMD is a program which formats — that is, prepares — a new disc for use on the system. GENCMD.CMD creates executable command files from Intel hexadecimal-format object-code files.

Pip.CMD is the peripheral interchange program, which is used in the main for copying files from disc to disc.

Finally, Stat.CMD is a program to display the disc files statistics. It marks files or drives as read-only and assigns physical devices to logical devices.

Also included on the system disc is Basic 86. To all intents and purposes it is the same as normal Microsoft Basic. There is also a program called Pippin which, like Pip, is a file-transfer program. However, the purpose of Pippin it to transfer files between computers, or more specifically between a large "master" computer and the Sirius.

Programmable codes

One of the most interesting aspects of the Sirius is the provision for a myriad of escape codes. These can be used either directly from the keyboard or within a Basic program. For example, the escape code to clear the screen is escape E. This can be entered by pressing the escape key, followed by E and then return.

On the screen is the normal CP/M-86 prompt, then up-arrow, square bracket, a pair of symbols used to display escape, then E. When return is hit, the screen goes blank and, the prompt followed by the cursor reappear at the top of the screen.

Accessing escape codes from Basic 86 is simple — remembering that the code for escape is 27. A short program to clear the screen would be:

```
10 PRINT CHR$ (27); "E";
```

That clears the screen and leaves the cursor in the top left-hand corner of the screen. There are many of these escape codes which make the cursor do almost anything you could possibly want.

Apart from the previous examples such as moving the cursor up and down various numbers of lines, making it flash, and clearing the screen — both partially and completely — escape codes can be used to insert text, reverse the video, transmit pages, change the intensity, underline and clear the foreground.

A pair of particularly useful routines are escape V and escape W. The first enables wrap-around of text at the end of a line. The second disregards any text which falls after the end of a line. They provide a facility which will be welcomed by word-processing users.

Another useful code — but offering a facility most other machines have anyway

(continued on next page)

(continued from previous page)

— is escape Y followed by a pair of numbers. This code moves the cursor by direct addressing — that is, escape Y 1,C moves the cursor to line number 1, column number C — remember that these numbers are in hexadecimal.

The Sirius keyboard is larger than most, encased in a shallow, grey case about 8in. by 18in. It is a masterpiece of ergonomics and is very easy to use conventionally, say, when using the WordStar package supplied with the review machine.

There are, however, a large number of keys which can be confusing especially as some of the keyboard functions do not always work. This is because all such functions are loaded from the system disc.

A further complication in the keyboard are the keys whose functions change, and the multiple-key commands. No doubt those codes which are used often are learnt quickly.

One rather strange quirk of the review machine was that when in Basic 86, the dollar sign which is used to denote a string variable could not be summoned by shift followed by 6, which is where it is marked. After a short panic I discovered that the pound symbol — that is, shift followed by 4 — appears on the screen during Basic 86 as the dollar or string symbol.

This quirk is no doubt due to the ASCII character set used by the Basic being that used in the U.S. It is a problem that can be easily ironed out because of Sirius' easily changeable software.

An ergonomic dream

The best aspect of Sirius' separate keyboard is its construction; each key is moulded and located exactly how and where it feels it ought to be. For someone who uses a keyboard professionally, it will really be a revelation. The keyboard on the early Pet bore no resemblance to a typewriter keyboard, but later personal computers such as the Tandy, Apple and 8032 Pet all had keyboards which were approximations to typewriters. Much as I abhor word processing, using a word-processing package with an ergonomic keyboard like this must be merely a chore — as opposed to the usual nightmare.

There are, however, not only the typewriter-like central core of keys, but another four groups. To the left of the main typewriter part of the keyboard is a cluster of five keys, called the special-function key group.

The top key of the group — marked ESC — is used to initiate the escape codes. The second enables the intensity control, the third is used to switch the reverse-video mode, the fourth enables underlining and the last activates the auto-repeat mode.

Slightly to the right of the typewriter keys is a group of 10 keys called the editing key group. These keys provide such functions as returning the cursor to the home position, clearing the screen, the generation of special codes for the applications software, the lowering and raising of the loudspeaker volume, and controlling the brightness and contrast of the visual display.

Above the central typewriter group is a set of seven general-function keys, primarily for use from within applications programs, but which can be used in other modes. For example, when in CP/M-86 the first key will act like Dir-carriage return, and display the file directory. Key number three acts as Control-C, the break command.

On the far right is the numeric keypad, an arrangement found on almost all microcomputers which claim to be primarily for business use. The idea of such a pad is that pure numerical data can be input much faster. These keys can be used

in any mode to display the number written on them, as can those operator signs included on this pad. It should, however, be noted that entering, say, 6 + 8 × 4 will not calculate anything; it just displays the symbols. The key marked Calc is intended for use from the applications software and Enter performs a carriage return.

The typewriter part of the keyboard is standard, nevertheless there are some anomalies. First, there are two keys that provide special functions: the Alt key, which enables the alternative function of another key, and the Cont key which provides the control-S CP/M facility. The other keys provide those characters printed on them.

As mentioned, the Sirius is entirely under software control. Unlike other machines, the character set or fount is read from disc on booting. In other machines the fount would be read from ROM. This means that the fount need not always be the same. This is very important, because in the past, manufacturers have done one of two things; either they programmed a ROM with the fount at source — usually in the U.S. — a process that meant U.K. users could print the dollar but not the pound sign. Or they would have available at slightly higher cost a fount prepared for a particular market.

If a microcomputer was used, for example, by an engineering company for word processing, it would be difficult to produce scientific equations without changing the ROM. There are ways round this, but they are not really satisfactory. The Sirius circumvents this problem. The review model was supplied with a large number of founts, including German, and scientific characters, with the integration symbol, various Greek letters, and so on.

It is even possible to use the Edot program — supplied with the machine to create customised founts. Each fount can contain up to 256 different characters which can be reversed. It would appear that a similar process is used when drawing graphics.

High-resolution graphics

The screen display is the last word in high resolution graphics, though slightly smaller than a conventional 80-column display. This is because, although the system employs the same size tube, only the middle part has been used so eliminating the effect of the curved corners of the screen. This stops words of text from bending. The green mesh which covers the screen has been applied in such a way that it strengthens the "squareness" of the display.

The high-resolution graphics characters are on a grid of 25 lines by 80 columns. Each character is in a 9-by-12 dot matrix, within a 10-by-16 cell. When in the graphics mode, each dot within each square is addressable and there is a total resolution of 800 by 400 pixels.

To show off just how high the resolution on the screen is, a demonstration disc of pictures was provided. They were instantly recognisable as the pictures used to demonstrate the Apple II high resolution. The difference was that the Sirius showed four pictures to a screen. One neat feature about the screen is that it swivels and tilts to the user's preferred viewing position.

Although the review machine was supplied without a printer, there is a full range available. I would suggest, however, that to make full use of the Sirius' graphic capabilities a high-resolution printer is required. ACT suggests a graphics printer. Dimensional details of the machine are: height 18in., width 18in., depth 20in., weight 49lb. and operating temperature — environmental — 0 to 49°C.

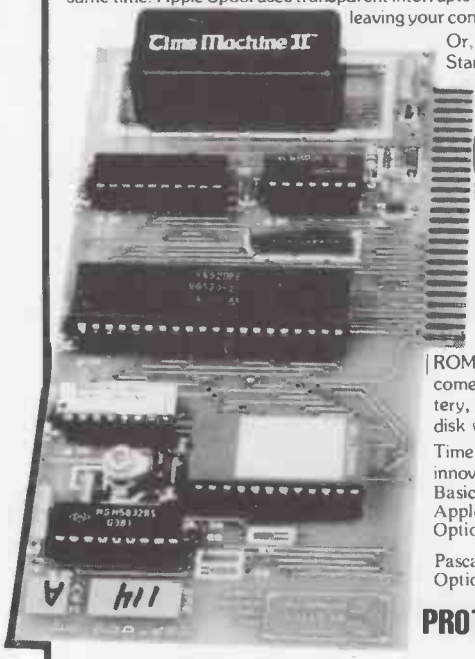
Conclusions

- **At a cost of around £2,400 for the 128K model, the Sirius 1 will present the more established personal computers with a serious rival.**
- **The generous allowance of memory, together with the soon to be announced high-density floppy discs will provide most users with all they need.**
- **CP/M-86 and the IBM operating system give users access to a very wide range of good applications software.**
- **A very impressive machine.**

Time Machine II™

REAL TIME CLOCK AND CALENDAR

Introducing a real-time clock that does more than just keep time. Our new Apple Spool TM software option lets your Apple execute two programs at the same time. Apple Spool uses transparent interrupts to spool files to your printer, leaving your computer free for other tasks.



Or, use our DOS Date-Stamper TM software to automatically add the date when disk files are created or modified. Also, the current time is displayed as part of the disk catalog.

And if it's just a clock you need, Time Machine II is the most sophisticated 1 second to 99 year clock peripheral available. Read, write, format, set and even interrupt routines are contained in a powerful 2K ROM driver. The basic system comes complete with clock, battery, 50 page manual and demo disk with DOS Date-Stamper.

Time Machine II. Designed for innovative Apple users.

Basic System	£79.95
Apple Spool Software Option	£19.95 +VAT
Pascal Software Option	£19.95 +VAT

PROTOCOL COMPUTER PRODUCTS
114 Widmore Road,
Bromley, Kent BR1 3BE
Phone: 01-460 2580

DEALER ENQUIRIES INVITED

Apple is a trademark of Apple Computer, Inc./Time Machine II is a trademark of Creative Software Development

● Circle No. 143

Got an apple? . . or an ITT 2020?
. . . then you want the wonderful

SINTA Shape Manager

It does for shapes what a word processor does for words.

This is a powerful professional package with capabilities way beyond anything out of a Christmas cracker. Sheer pleasure to use. Among over 30 facilities it lets you:

- **trace new shapes straight onto the screen**
- **draw half a shape and autogenerate the reflection — just like that!**
- **recall shapes and modify or combine them**
- **generate families of shapes**
- **edit shape tables, e.g:**
- **rearrange the order of entries**
- **insert or delete shapes**
- **make new tables from mixtures of old ones**

and much more.

Efficient coding (no crude scanning techniques) economises on memory, makes shapes fast on the draw.

Super package includes tracing aids and literate manual with many practical tips on using shape tables in your programs.

Requirements: 48K RAM, Applesoft or Palsoft in ROM, Single disc drive

Usually £59.95

Special Spring offer Ends 31 March 1982 £39 plus £2 p + p

SINTA • 3 Bainfield Gardens • Brighton • Sussex • BN2 2HQ • (0273) 688373

● Circle No. 144

Unrepeatable Offer! –until 31st March 1982

ACT SIRIUS 1 128K microcomputer with 1.2 M disk storage. Including CPM/86, MSDOS, microsoft basic and utilities.

List Price: £2395 +VAT

Offer Price: £1995 +VAT (c.o.d.)

CASEWELL MORTIMER
The complete service for Sirius
Casewell Mortimer Ltd. Unit 2, Station Drive, Bredon, Tewkesbury, Gloucestershire, U.K. Telephone (0684) 72924

● Circle No. 145

● Circle No. 146 ▶

57

ANNOUNCING THE NEW SORCERER

1.2 Megabyte

ONLY £2,680
or £16 per week rental
(exclusive of VAT)

The VIDEO DISK UNIT can be linked with any printer and comes with a FULL YEAR'S guarantee from EMG

Dealers invited

Educational discounts

For Wordprocessing and Accountancy

DISTRIBUTED BY EMG AT EMG MICRO CENTRES

The LONDON MICRO CENTRE
47 Lower Belgrave Street
LONDON SW1
Telephone: 01-730 8791

The SOUTH LONDON MICRO CENTRE
30 Heathfield Road
CROYDON
Telephone: 01-688 0088

Contact us today for further information

An **EMG** Company

We proudly announce the arrival of the computer-frame you have been waiting for

pearcom®

A new Europe-PAL microcomputer frame.

NOW AVAILABLE £995 excluding VAT

Main features:

- large amount of compatible software already available
- interactive cards, firmware & hardware available everywhere
- 14 I/O expansion slots as standard
- screen size: 24 lines of 40 characters, Upper and Lower case with optional card expansion to 24 lines of 80 characters.
- 32k byte of RAM standard, on board expandable to 96k byte
- uses the popular 6502 CPU
- bus compatible with the Z80 Firmware Card with CP/M and Microsoft BASIC
- Programming languages including BASIC, Fortran and Cobol etc., are available separately
- full PAL-colour video supplied as standard with sound through TV
- professional keyboard with function keys and number pad
- Character set with 255 characters in reprogrammable EPROM, delivered standard with Upper and Lower Case characters, Greek and pseudo graphics, and a jumper selectable choise of QWERTY or AZERTY
- For optional extra's such as an EPROM-programmer, microphone, joystick etc., there is a special lid beside the keyboard for user hardware
- A sturdy, light weight four-piece moulded case of strong polyurethane in two colours beige/black.

DEALER INQUIRIES INVITED

pearcom®

VERGECOURT LTD. 17 Nobel Square, Basildon Essex SS 13 1LP England Tel. 0268 - 728484 Tlx. 995323

Sole Distributors

59

5¼" WINCHESTERS

* Complete Systems Available
* Sub-Systems for S100 computers
* Sub-Systems for Z80 computers
* Fast Drives with Buffered Seeks
* Versatile Controller

Drives Available NOW!

The long-awaited 5.25" Winchester drives are available now from Hotel Microsystems. The greatly improved speed and storage capacity made available by the mini-Winchesters now make feasible many applications, for which floppy drives were too small, too unreliable or too slow. Drives of different capacities ranging from 2.5Mb to 12Mb are available. All the drives we supply have their own microprocessor and are thus able to provide buffered seeking resulting in vastly improved performance.

Versatile Controller

The XCOMP Winchester controller is a custom designed microprogammable controller which consists of two printed circuit boards. It has buffered seeking capabilities and is upwards compatible to higher capacity drives.

Complete Systems

The North Star Horizon microcomputer is now available incorporating any of the mini-Winchester drives featured above.

S100 Sub-Systems

An upgrade kit for users of S100 microcomputers contains all the hardware required to add a Winchester in place of a mini-floppy drive. The XCOMP ST/S S100 controller is included together with an S100 card which provides the necessary power supplies to connect to the Winchester. Fitting to the microcomputer is straighforward — no soldering is required and the Winchester is housed in the same place as the floppy drive it replaces. Horizon users have a choice of software; either the high-performance HMSOS single/multi-user operating system or CP/M.

Z80 Sub-Systems

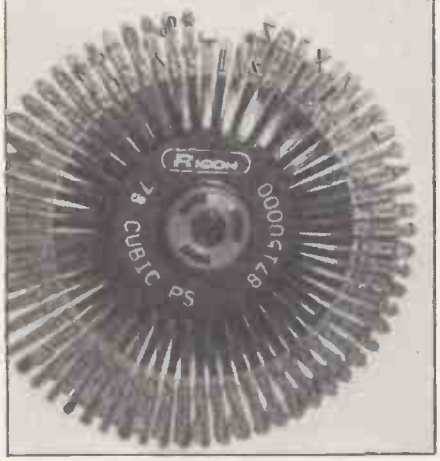
The sub-system for Z80-based microcomputers consists of a packaged drive and controlier with power supply. The controller is the XCOMP ST/R custom desgined microprogrammable controller. The two printed circuit boards are connected via a 50-way ribbon cable to an interface board which plugs into the Z80 socket in your microcomputer. The sub-system is housed in an alloy cabinet with a power supply. Source listings of CP/M drivers are available.

Sub-Systems are also available for APPLE and PET

Hotel MicroSystems Limited

60 69 Loudoun Road London NW8 0DQ Telephone 01-328 8737/8 Telex 266828 H M S-G

RICOH RP-1600



We tested this recent daisywheel printer from Japan alongside Appropriate Technology's new Flowriter, based on the Ricoh mechanism. Chris Bidmead reports.

THE FASTEST daisywheel printers on the market today are Japanese, and the very latest models are claiming a speed of 80 characters per second. We thought Ricoh's specification of 60 cps impressive, but judging from the machines we have reviewed to date we were aware that the figures are probably derived from optimised runs on the manufacturer's test bench. They might not reflect actual speed in use.

Our usual tests proved this to be the case. The Ricoh RP-1600 is fast, and may well print at 60 cps in short single-line bursts with no carriage-returns. Sadly, few office documents fit that restriction.

Angularity avoided

The Ricoh's cream-coloured static-proof metal case is well styled, somehow managing to avoid the angularity of the Qume and latest Diablo. The machine is noticeably smaller than some of its rivals: its height without attachments is 20cm. and the front-to-back depth is about 40cm. The power pack is internal, so these dimensions represent the true size of the working machine.

The version under review — which is compatible with Sprint 3 — comes with no front panel, although other versions offer an option of a top-of-form switch and printer-state LED indicators. You reach the innards by lifting the spring-counter-balanced front cover, unclipping the platen in the fashion set by the old IBM golf-ball typewriter, and releasing two small captive bolts inside the cover to the left and right of the chassis. The top half of the case can then be lifted straight off, with no snagging mechanisms to be manipulated round and no trailing wires attached.

The printer chassis is a solid aluminium casting, nestling into the foam damping that lines the case and keeps the noise down to a claimed 59dB. The main motor, a high-torque device Ricoh makes in-house, is situated centrally under the platen, driving the print head via steel pulley wires in the conventional fashion. Any stretching of this wire in use is compensated by a powerful spring, and there is an arrangement to take up the slack with a screw thread when wear becomes excessive. The designer seems to have planned on a long life for these pulley wires, which are lubricated in manufacture and sealed in a plastic coating.

With the RP-1600 Ricoh has introduced yet another standard of daisywheel, though there is good sense behind this apparent contrariness. The Ricoh wheel is some 20 percent smaller in diameter than the familiar Diablo/Qume counterpart, keeping down the rotational inertia and thus helping to pep up the speed.

The number of petals is reduced to 64 while Diablo/Qume standard is 96. Each Ricoh petal carries two characters, so some of the characters have to be accessed by a shift mechanism like a typewriter's. The component that carries the burden of this extra task is called the "dog-bone," an electromagnetically operated articulation in the axle that drives the wheel. It seems a vulnerable piece of additional mechanics to have introduced at a time when the whole thrust of development is towards reducing the number of moving parts. But this is a theoretical objection only — during a long test period the "dog-bone" gave us no trouble.

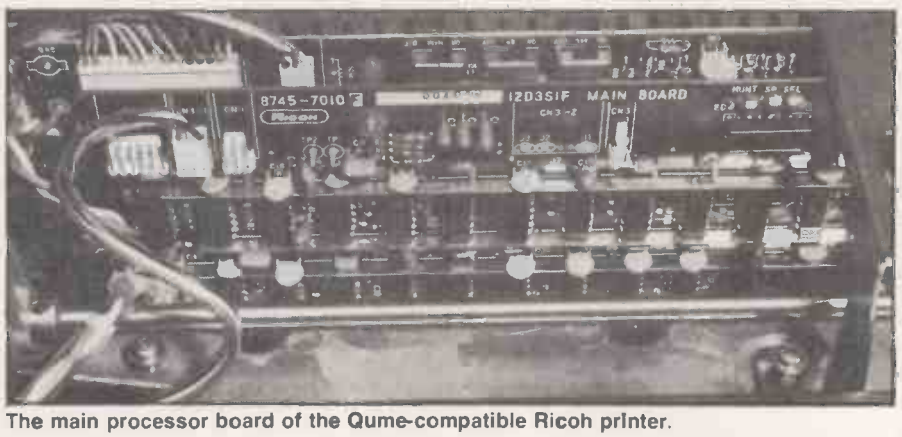
There was some significant extra engineering in the daisywheel itself. The Diablo equivalent has the advantage of cheapness, being moulded as a single piece to be mass-produced more or less like a gramophone record. But the compromise requires the plastic to be both flexible and light for the petals, and impact-resistant for the character face. We have found that the founts on these single plastic wheels tend to flatten noticeably in use, particularly on a poorly-adjusted machine. Diablo does offer the alternative of a well-engineered metallised wheel, but at the hand-tailored cost of about £35.

Hand-tailoring

The Ricoh approach splits the difference. Tailoring very like that of the metal wheels has gone into the Ricoh daisywheels: a separate plastic is used for the body of the wheel and the flexible arms, which are embedded in a vibration-damping rubber-like base. By skipping the metallising stage, the end-user price of these wheels is kept below £12.

All the electronics of the basic machine are housed on a heat-dissipation panel screwed into the rear of the case. To reach the boards once the case is open you have to remove a heavy, perforated, metal, static shield. Again, the solidity and finish of this component are impressive.

The Sprint-3 interface is piggy-backed on to the main processor board. Although accessible, this pair do not exactly invite removal, being held on to the lower part of the case with two bolts concealed under a pair of plastic protection caps which also serve as feet when the machine is stood on end. We shirked the task of unclipping all the necessary connectors to get these boards out, but a peek at the components in place — the main processor is the 8085, the speeded-up version of the 8080 — seems to confirm the manufacturer's claims that the electronics are "state-of-the-art".



The main processor board of the Qume-compatible Ricoh printer.

While the electronics were uncovered we took the opportunity to run the self-test program, which puts the print mechanism through its paces while little

(continued on next page)

◀ ● Circle No. 148

(continued from previous page)

winking LEDs on the processor board monitor its progress. We were reassured by the manufacturer's claim that had anything gone down, these on-board diagnostics should be enough to isolate the trouble without additional test gear.

Nothing did go wrong during the course of a long trial. The claimed mean time between failures of over 2,000 hours is now becoming standard on the present generation of daisywheel machines, thanks to the reduction in the number of moving parts. The RP-1600 certainly seems extremely robust, and runs quietly and coolly even during day-long continuous use.

Variety of guises

Nexos is the exclusive OEM franchise agent for the RP-1600 in the U.K., Ireland, and most of Europe. A new daisywheel printer typically comes to the market-place with the bare bones of its mechanism dressed up in a variety of guises. Nexos/Ricoh marketing is no exception, and in addition to the Sprint-3 look-alike we tested, Nexos also offers a Hi-Type II Diablo version, and a Centronics C-3 interface.

An RS-232 version was in preparation at the time of writing, but a firm by the name of Appropriate Technology, otherwise known as ApTec, is ahead of Nexos here. Dr Ali Baghdadi, the brains behind this small British company, was able to lend us an RS-232/Diablo-compatible version of his new Flowriter, a development of the RP-1600 basic mechanism that features a substantial character buffer for fast, smooth throughput at speeds up to 9,600baud. This data-transfer rate is not, of course, matched by the print head: the idea of putting memory into the printer is to release the central processor in the computer from the need to stay hooked to the time-consuming needs of the "real-world" device.

There are two additional advantages to the RS-232/Diablo - compatible interface of the Flowriter we had on loan. The data line is simple to install, as you can attach it to the computer with four wires — or three, if you do not overflow the buffer. As most commercial word-processing software is provided in versions that send Diablo codes, the printer should require no special software adaptation.

ApTec, now manufacturing and marketing the project in association with Small Systems Engineering, has achieved this by adding a special interface board inside the machine. Printers normally employ some sort of buffer between the data line and the print head so that a jerky supply of characters can be translated into a smoother load for the moving parts.

Usually these buffers are of the order of 125 to 256 bytes. But Baghdadi has taken advantage of the space available on his interface board inside the Flowriter to put in a 2K buffer, with a de-luxe 8K option.

The 8K buffer in the review version can deal with about five pages of A4 double-spaced text, and it proved very useful when printing out files of this size or larger to be able to leave the printer to get on with its work. To make the most of the facility, either continuous stationery or a sheet-feeder is essential.

If you are more used to working with single sheets it will take time to overcome the feeling of being out of control of the printer. The latest revision of the firmware implements the Diablo ESC CR P as an instruction to abort the buffer immediately, which returns a measure of control to the user's keyboard.

Retaining control

We suggested to ApTec that it would be an advantage to be able to switch out the buffer altogether. There are times when it is useful to retain control of the printer from the computer keyboard — to print a list from the screen on to an odd scrap of paper, for example. We gather that future versions will incorporate a buffer-defeat option into the software.

The flexibility of the RS-232 interface is gained at the expense of some speed: TTL logic inside the computer is being translated into a bit stream padded with start and stop bits, and then translated back again at the other end. But with proper handshaking — the Flowriter offers hardware handshaking or a choice of ETX/ACK or DC1/DC3 — the Ricoh mechanism can be driven at a speed almost rivalling that of the Qume-compatible version. The Flowriter is also available with either a Centronics or an IEEE interface.

TEST	TIME TAKEN	COMMENTS
Standard text test		
Qume-type (Q)	1m. 23s.	Not much difference between Q and F — around 47 cps.
Flowriter (F)	1m. 25s.	
Formatted text test		
Qume-type (Q)	42s.	Nearly 15 percent faster than the Diablo 630. RS-232 is only a small overhead.
Flowriter (F)	48s.	
Tabbing test		
Qume-type (Q)	30s.	An excellent speed, but for both Q and F alignment was poor in comparison to the Diablo and Spinwriter.
Flowriter (F)	36s.	
Graphics test		
Qume-type (Q)	3m. 30s.	Very fast for Q: the parallel interface pays off.
Flowriter (F)	6m. 00s.	F is respectable for RS-232.

These tests are fully described in the Diablo 630 review, published in the March 1981 *Practical Computing*.

Formatted text test Both machines save time by ignoring spaces, and only move to a column when instructed to print a character. The vertical equivalent, platen-movement optimisation, is implemented on the Qume-compatible version only.

Tabbing test On both machines the high speed of the print-head pays its price in this test. After its travel across the tab the print-head is still oscillating as it prints the vertical-bar character. Unlike the later Diablo machines, which incorporate an escape-code instruction to increase the "settling time" — the time between the print head arriving at its destination and printing a character — there is no comparable instruction to improve the Ricoh mechanism's rather poor character alignment after tabbing.

Graphics test The parallel interface of the Qume type is more complicated to implement but pays dividends here. The Flowriter's speed is respectable for RS-232, but USART computations and the large count of start and stop bits that have to be introduced into the line at the transmitting end and removed at the terminal inevitably create an overhead in speed.

Conclusions

- **The Qume-compatible parallel-interface version is almost twice as fast as the Flowriter in graphics mode. But the Flowriter is only marginally slower during normal printing.**
- **The RS-232/Diablo version of the Flowriter we tested is simpler to connect to a variety of different computers, and the buffer makes for easier use in applications like batch mailing.**
- **The only disadvantage of either machine is the very slightly more ragged text the mechanism produces. This is really only appreciable to the eye when columns of vertical characters need to be critically aligned, as in the production of tables for camera-copy.**
- **Both machines reviewed were based on the Ricoh RP-1600 print mechanism, a fast and solidly-engineered device. The Diablo mechanism still produces the best-formed print we have seen, but for most normal office purposes this Japanese product, in both Flowriter and Qume-compatible versions, seemed to us to come out well ahead.**
- **Ricoh/Nexos Qume Sprint-3 version £1,500**
  Flowriter with 2K buffer £1,660
  Flowriter with 8K buffer £1,720
  keyboard £250 extra

Why gamble on being right?

Choose the Daisy wheel printer compatible with any hardware or software you may have!!

The Ricoh Flowriter is the most advanced Daisy wheel printer on the market so far. With a 60 character/second speed and equipped with a Z80 microcomputer it combines the features of all advanced word processing and graphics printers on the market.

- Compatible with QUME SPRINT 5 and DIABLO 1640 standard and enhanced word processing commands.
- Auto bidirectional printing
- Auto logic seeking in both vertical and horizontal directions
- Graphics capability Down to 1/128".
- Proportional spacing tables programmed internally
- 8K and 16K buffer under full program control — allows switching buffer on/off, or repeat printing buffer contents without a need for monitoring by computer.
- Three interfaces included internally: Centronics — IEEE 488 — RS232C with ETX/ACK, DC1/DC3 and DTR handshaking protocols.
- Detached keyboard option.

The printer that does more and costs less .....

The Ricoh

FLOWRITER

For details:
APTEC Microsystems
2/4 Canfield Place, London NW6.
Tel: 01-625 5575 Telex: 264538/SSE

APTEC

● Circle No. 149

Pete & Pam Computers

VISICALC 3.3 Our Price £105.00
At last – Visicalc on 16 sector DOS 3.3 with 12 additional commands. Enhanced Manual is included.

VISIDEX £105.00
New from Personal Softcard – type in whatever key words, phase dates or numbers you want the info to be associated with and store away.

VISITERM £79.00
Allows your computer to communicate with larger computers or other personal computers. Link your personal computer with your company's mainframe.

VISIPLOT £85.00
Automatically creates high resolution graphs and charts. Visualise data in six different formats and 6 different colours. Data can be directly entered or data files loaded from VISICALC 3.3.

VISITREND £129.00
Allows you to perform sophisticated math operations on a time series data such as stock prices or production figures. Includes multi-line regress cumulative total percent charge lead/lag moving averages, smoothing and various transformations which let you create new time series. This package also includes VISIPLOT.

VISIPAK £325.00
A Visicalc 3.3, Visitrend/Plot and Visifile all in one pack.

VISICALC UTILITIES VUno3 £39.95
From Progressive Software – add to Visicalc's capabilities.

VISIPLUS + Allows you to consolidate Visicalc models. £19.95

PASCAL JDB CONTROL SYSTEM – from High Technology £195.00
A fast sophisticated job control/costing system able to control costs on 400 jobs providing useful reports and maintaining 50 cost centres.

DB MASTER £129.95
The data base with 100 fields operating on multi-diskette files for large capacity.

DB MASTER Utility Pack No.1 £60.00
Links DB Master with Apple text files and VISICALC 3.3 add delete or change existing DB Master fields and more.

DB MASTER for Corvus – available soon £295.00

INFORMATION MASTER – Date Base £79.00
A dream to use has advanced facilities such as global change and calculator mode of entering figures. A system that a novice can use with ease.

DATA MASTER £55.00
A utility for use with INFORMATION MASTER allows the splitting of data base system selectivity change of field types and transfer of print formats.

TRANSIT £29.00
A utility that enables you to link INFORMATION MASTER to many files including those created by VISICALC. With 500 sub cost centres. Worth its weight in gold!

DATA FACTORY (88 fields) £99.95

PFS PERSONAL FILING SYSTEM £55.00
PFS REPORT £55.00

VISIFILE £139.00
New date base from Personal Software.

WORDSTAR for Apple £169.00
If you want the best in word processing for Apple then WORDSTAR is the answer. Very well documented and great to use. Requires the installation of a Z-80 Softcard.

MAILMERGE £69.00
Allows you to maintain name and address lists and merge fields into text to form letters etc.

SUPERSORT £105.00
For use with Wordstar and Mailmerge.

DATASTAR now available on Apple £169.00

CALCSTAR – The very latest from Micropro £99.00
An electronic speed sheet ala Visicalc with the capability of moving information into Wordstar for improved presentation and ease of use. A must for every Wordstar user.

DATASTAR £99.00
The very latest from Micropro, Calcstar, an electronic spread sheet ala Visicalc with the capability of moving information into Wordstar for improved presentation and ease of use. A must for every Wordstar user.

LETTER PERFECT £99.00
A WP system that will work with both 40 and 80 column system configurations.

APPLE PIE £99.00
A separate package is available for use either 40 col. Double Vision, Videx, Smarterm or Supreterm 80 col boards.

SUPER TEXT II £85.00
A WP system that has added arithmetic functions to WP power.

SUPER TEXT FORM LETTER £55.95

SUPER TEXT ADDRESS BOOK £29.95

All three SUPER TEXT together £150.00

MAGIC WINDOW £55.95
A complete letter writing system – much advertised

BASIC MAILER £39.95

SOFTKEY £99.00
IBasic or pascal version available! A 15 key programmable keypad.

Patch for WORDSTAR and SOFTKEY to permit use of programmable pad with WORDSTAR. £29.95

SUPER-TERMINAL £195.00
WIZARD 80 £195.00
A new 80 column board with both switchplate and softswitch.

VIOEX VIDEOTERM £185.00

40/80 Column switchplate £12.95
Video softswitch £21.95
Character Eproms: French, German, Katakana, Spanish, Inverse, Math and Greek symbols, Super and subscript, Line draw graph £17.95
Videoterm Utilities disk £22.95

NEW! – VIDEX KEYBOARD ENHANCER II £89.00
The very latest from Videx – uses 6504 microprocessor to provide typewriter like keyboard, adds ability to store macro instructions, remembering words and phrases. Can remember what you typed whilst your Apple was busy talking to disk or doing other things. Can auto-repeat any key held down. Replaces the existing keyboard encoder for easy installation

PASCAL TUTOR £79.00
If you want to learn Pascal this is the package to use – complete with two disks.

APPLE MUSIC THEORY £29.95
Apple Inc's own program designed to teach the fundamentals of music.

APPLE HOW TO £29.95
Lessons in integer programming.

APPLE SHELL GAMES £14.95
An interesting shell in which to place your children to learn in the best way.

TYPING TUTOR £12.95

Programs from eduware
Algebra 1 – Compumath: Fractions – Compumath: Decimals – Spelling Bee Each £20.95
Arithmetic skills £26.95
Compu-read £12.95
Perception £10.95
Counting Bee £15.95
Edu-pac 1 £22.95

CHEMISTRY LAB SIMULATIONS £55.00
No. 1 – Acid-base titration, Avrogadro's number – No.2 Ideal Gas law and entropy – No.3 Calorimetry experiments, Hass' law – Thermodynamics of an Equalibrium reaction and heat of Vaporisation –

AIDS TO O' LEVEL COMPUTER STUDIES £60.00
5 disks by Pedagog Aids.

MOUNTAIN MUSIC SYSTEM £239.00
A 16 voice digital synthesizer for Apple, now much reduced price.

Crae 2.0 – Mcat – Applesoft Program Optimiser Each £13.95

Applesoft structured BASIC – DOS Plus – Multi-Disk Catalog II – Quickloader – Applesoft Utility Programs Each £15.95

Disk Organizer II – Disk Recovery – The Directory Manager – Graphic Writer for Tiger 445/460/560 – Higher Graphics II Each £17.95

Program Line Editor – Higher Text II – Applesoft Command Editor – Macro Screen Editor – Graphic Dump Programs for 445/460/560 Tiger, Anadex 9501, Spinwriter, in both PASCAL and BASIC Each £20.95

Apple Doc – Program Line Editor in ROM – Applesoft Extended Editor (AXE) Each £24.95

DAKIN 5 Programming Aids 3.3 (12 utilities in one pack) £49.95

APPLE DOS TOOL KIT £36.95
Animation, programming and assembling all in one pack from Apple Inc.

PASCAL PROGRAMMER £79.00
The pascal programmer's dream – all the utilities you wanted to use but never had time to write.

DOS SOURCE 3.3 £24.95
A disassembled listing of DOS on 4 sides of 2 disks – Limited Edition.

SENSIBLE SOFTWARE UTILITIES
Applesoft Programme Optimiser £12.95
Multi Disk III £14.95
Super Disk Copy III £17.95
DOS Plus £17.95
Disk Organiser II £17.95
Disk Recovery £17.95
Applesoft Plus Structured Basic £14.95

GRAPHIC UTILITIES
Apple World £34.95
3D Supergraphics £21.95
Animation Pack £39.95
Animation Pack Editor £17.95
Graphic Enhancement £15.95

Saturn Navigator (needs animat. pack) £15.95
Micropainter £20.95
PASCAL Graphics Editor (Sirius) £59.95

VERSAWRITER £149.95
Superb graphics tablet from Versa Computing – you don't have to go to the expense of an Apple Graphics Tablet for graphics capability.

VERSA EXPANSION SOFTWARE £20.95
Auxiliary pack for the VERSAWRITER includes the ability to draw in fine detail using magnification mode.

BOOKS
Beneath Apple DOS £11.95
HYOE – Assembly Language Programming £11.95
INMAN – Assembly Language Programming £11.95

MACHINE COVERS – only the best material used
Apple only £5.95
Single Disk £2.95
2 stacked disks £4.45
Apple, 2 disks and 9" monitor or Apple and 12" monitor £8.95
Apple and 2 disk £7.95
Epson MX 70/80 £5.45
Paper Tiger 445 - 460 £5.45
Apple, 2 disks and 12in monitor £9.95
12in monitor cover £7.95
9in monitor cover £5.45

BASF DISKS (for 10) £18.50
DYSAN DISKS (for 10) £25.00
Kassette disk boxes 5.25 in £2.45

Z80 SOFTCARD £195.00
A Z-80 microprocessor for Apple comes with CP/M operating system and Microsoft Basic 5.

COBOL 80 £299.00
FORTRAN 80 £109.95
BASIC COMPILER £199.00
ASSEMBLY LANGUAGE DEVELOPMENT (6502, 8080 and Z80) £79.00
MYCHESS £20.95
A chess game for Apple with a Z80 Softcard installed – beats Sargon II.

Z TERM £59.00
Software that allows you to emulate the terminal of your choice whilst using Apple with a Z-80 Softcard.

THE MILL – A 6809 plug in board for Apple £249.95
Can run at full speed whilst the 6502 runs at 20%. Comes with either a Pascal speed up kit to increase the speed of execution of Apple's U65D Pascal or a 6809 assembler. Also available a debugging utility. Coming Soon – OS9 Operating System.

64 RAM CARDS
Here at last! Can be used in pairs to emulate a disk drive
2 cards and card emulating software £499.00
Single board £225.00

VISTA 8 INCH CONTROLLER CARD £349.00
Works with 8 inch double sided double density drives to give autoboot capability in Applesoft, CPM, and Pascal on Apple

REMOTE OPERATING SYSTEM – ROS £499.00
Provides multiple Apple II users with the capability of utilising the disk storage available from one control Apple, up to 127 remote computers may be connected to one central Apple containing up to 8 floppy disk drives starter system (1 central + remote board(s) with software and cables.

APPLE OS9 – STELLATION TWO'S MILL 6809 £399.00
Now available with OS9 and BASIC 09.
BASIC 09 allows simultaneous running of separate programs. It has to be seen to be believed. IOS9 is modelled along the lines of UNIX).

Single board £124.00

EPSON MX 80 T £349.00
9 × 9 matrix printer with friction and tractor feed

EPSON MX-80 T £349.00
Tractor feed only.

INTERFACE AND CABLE £65.00
For the above (non-graphic).

GRAPPLER from Orange Micro £99.00
An interface for the Epson MX 80 and 100 that obeys Apple protocols and has a graphics dump programme in ROM producing 2 sizes of picture and 360 degrees rotation with positive or negative image.

AIO Parallel / Serial Interface from SSM £119.95

MOUNTAIN CPS – Multi-function Card £135.00
A bi-directional serial interface – parallel port and clock/calendar card – all on one board. Can be made to use phantom slots.

RAMCARD £99.95
A 16K Expansion card for your Apple. It will provide additional memory for Visicalc load integer from a System Master and is fully compatable with Apple's Pascal System. The only board with Neon Read/Write indicators. The only card with data bus lines for faster data retrieval.

RAMEX 16 £89.95
UK entrant to the expansion card market – does not need to be ribboned to the memory area.

THE MANAGER £19.95
A utility that moves DOS onto a 16K expansion card – freeing motherboard Ram space for larger programs.

TG PRODUCTS
JOYSTICK – Self-centering, adjustable pots £34.95
PADDLES – Top quality controllers £20.95

VERSA EXPANDER PORT £12.95
An expansion cable ZIP socket for the Apple game I/O socket-allows zero insertion force of peripherals requiring connection to game socket.

★ ★ **SPECIAL OFFER** ★ ★
EXPEDITER II only £49.00
An Applesoft Compiler from On-Line Systems.

TASC – THE APPLESOFT COMPILER £99.00
A two pass compiler from Microsoft – the Applesoft authors. Comes with extensive documentation and copyable disk. Compiles to disk so can compile any length of programme. From 2 to 20 times improvement in speed.

NEC GREEN SCREEN MONITOR £139.00

ABT NUMERICAL KEYPAD £74.95

APPLE HOW TO £29.95
Requires Int Basic or 16K Expansion Card – teaches calculating and programming.

APPLE MUSIC THEORY £29.95

ELEMENTRY MY DEAR APPLE £19.95
Tuition for children.

ECHO II SPEECH SYNTHESIZER £139.95
Based on TMS 5200 chip from TI – type in speech direct from keyboard.

EXPANSION CHASSIS £399.00
Long awaited – here at last – More slots for your Apple.

GAMES

Apple Galaxian – Galaxy Wars – Head-On – Galactic Revolution – Galactic Trader – Galactic Empire – Mystery House – Bridge Partner – Checker King – Gammon Gambler – Roulette – Craps – Apple 21 – Puckman – Global War – Space Warrior – Apple Typhoon – Sneekers – Galactic Attack – Olympic Decathlon – Cribbage – Star Dance – Asteroid Field – Anti Ballistic Missile All at £12.95

Microsoft Adventure – ABM – Dog Fight – Phantoms Five – Orbitron – Pulsar – Microchess 2 – Odyessy – LA Land Monopoly – Morloc's Tower – Rescue at Rigel – Space Eggs – Trilogy of Games – The Prisoner – Raster Blaster – Autobahn – Space Raiders – Tawala's Last Redoubt – Gamma Goblins – Apple Panic – Red Alert – Firebird – Genetic Drift – Mad Venture – Space Quarks – Castle Wolfenstein – Appleoids – Pegasus II – Softporn Adventure – Cross-Fire – Jaw Breaker – Zork II – Crush-Crumble and Chomp – Dragon's Eye – Oark Forest – Star Thief – Bug Attack – Outpost – Borg – Sneakers – Hi Res Soccer All at £14.95

Cyborg – OO-Topos – David's Midnight Magic – Akalabeth – Pool 1.5 – Beer Run – Epoch – Hadron – Russki – Duck – Ulysses – Wizzard and the Princess All at £17.95

Computer Conflict – Computer Quarterback – Cartels and Cutthroats – Space Album – Bill Budge 3D Graphics Tutor – Cyber Strike – 3 Mile Island – Adventure 789 – Temples of Apshar – Hellfire Warrior – Zork – Computer Baseball – President Elect – The Battle of Shiloh – Tigers in the Snow – Warp Factor – Computer Conflict – Gorgon – Flight Simulator – Ultima – Trick Shot – Robot War – The Best of Muse – Cops and Robbers – Southern Command All at £20.95

Computer Air Combat – Computer Ambush – Computer Bismark – Operation Apocalypse – Torpedo Fire – Dragon Fire – Napoleon's Campaigns All at £29.95

Authorised Apple Sales and Service

LONDON RETAIL, 98 Moyser Road, London SW16 6SH
Tel: 01-677 2052/7341

MAIL ORDER AND DISTRIBUTION, Waingate Lodge, Waingate Close Rossendale Lanc BB4 7SO.
Tel: Rossendale (0706) 227011

ACCESS
BARCLAYCARD VISA

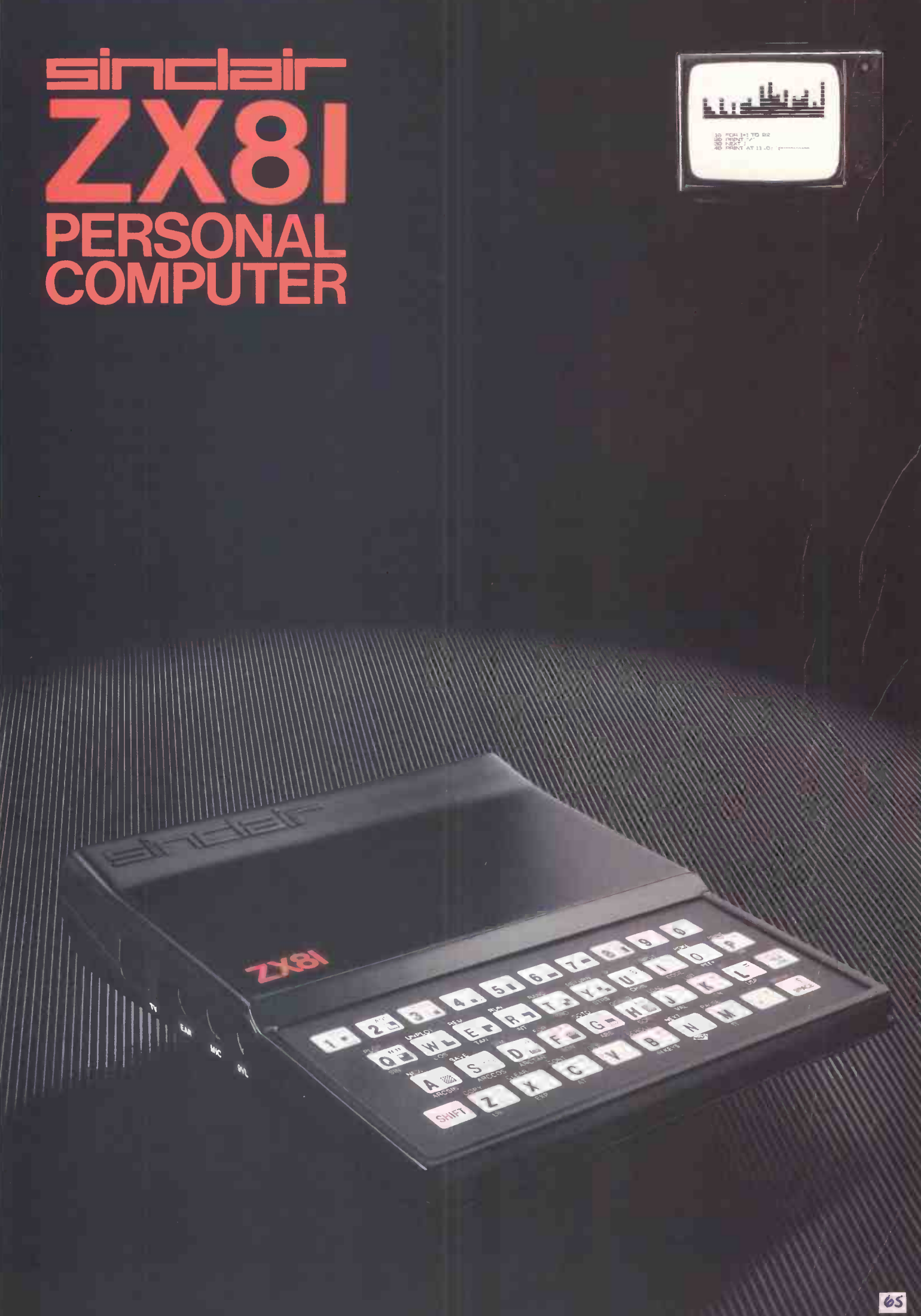
Prices do not include VAT
Please add 15% VAT to your remittance
Postage and packing FREE

Telex No. 635740 Orders welcome by phone or telex PETPAM G

● Circle No. 150

● Circle No. 151 ▶

sinclair ZX81 PERSONAL COMPUTER



Sinclair ZX81 Personal Comp the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.95

Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

New, improved specification

- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

Built: £69.95

Kit or built – it's up to you!
You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.

iter-

Available now- the ZX Printer for only £49.95

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics *and* highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further intructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you *can* plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

How to order your ZX81

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the no-stamp-needed coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. Order

Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	49.95	
	Sinclair ZX Printer.	27	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

☐ Please tick if you require a VAT receipt TOTAL £

*I enclose a cheque/postal order payable to Sinclair Research Ltd, for £

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable.

Please print.

Name: Mr/Mrs/Miss

Address:

FREEPOST – no stamp needed. PRCO3

sinclair ZX81

6 Kings Parade, Cambridge, Cambs., CB2 1SN.
Tel: (0276) 66104 & 21282.

How the ZX81 compares with other personal computers

SYSTEM IDENTIFICATION		ZX81	ZX80	ACORN ATOM	APPLE II PLUS	PET 2001	TRS 80 LEVEL I	TRS 80 LEVEL II
ROM		8K	4K	8K	8K	14K	4K	12K
GUIDE PRICE	Basic unit – inc. VAT	£70	£100	£175	£630	£435	£290	£375
	Unit plus 16K RAM (*12K RAM)	£120	£150	£285*	£630	£530	£360	£375
COMMANDS	LIST, LOAD, NEW, RUN, SAVE	●	●	●	●	●	●	●
STATEMENTS	PRINT, INPUT, LET, GOTO, GOSUB/RETURN, FOR/NEXT IF/THEN	●	●	●	●	●	●	●
	STEP	●		●	●	●	●	●
	TAB	●			●	●	●	●
ARITHMETIC	ABS, RND	●	●	●	●	●	●	●
FUNCTIONS	INT	●			●	●	●	●
	ATN, COS, EXP, LOG, SGN, SIN, SQR, TAN	●			●	●		●
	ARCSIN, ARCOS	●						
STRING	CHR$	●	●		●	●		●
FUNCTIONS	LEN	●		●	●	●		●
	ASC(CODE), STR$, VAL, INKEY$	●				●		●
NUMBERS	FLOATING PT $\pm 10^{\pm 38}$	●			●	●	●	●
	INTEGERS		●	●	●	●		●
NUMERIC	A-Z			●			●	
VARIABLES	AA-ZØ				●	●		●
	An-Zn, n = any alphanumeric string	●	●					
STRING	A$ & B$						●	
VARIABLES	A$ to Z$	●	●	●				
	An$ to Zn$ n = any alphanumeric character				●	●		●
NUMERIC	SINGLE DIMENSIONAL		●	●			●	
ARRAYS	MULTI DIMENSIONAL	●			●	●		●
DISPLAY	ROWS	24	24	16	24	25	16	16
	COLUMNS	32	32	32	40	40	64	64
	LOW RES GRAPHICS (<7000 pixels)	●	●	●	●	●	●	●
	HI RES GRAPHICS (>40000 pixels)			●	●			
SPECIAL	USR (CALL, LINK)	●	●	●	●	●		●
FEATURES	PEEK, POKE (OR EQUIV)	●	●	●	●	●		●

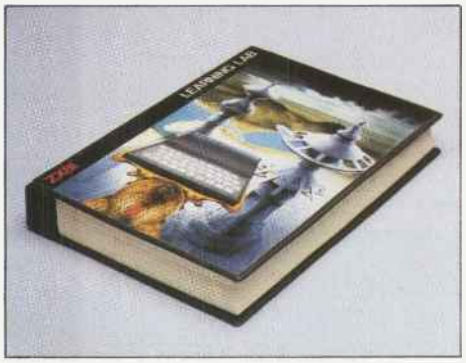
Sinclair software on cassette.

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with others to form single-subject cassettes.

Software currently available includes games, junior education, and business/household management systems. You'll receive a Sinclair ZX Software catalogue with your ZX81 – or see our separate advertisement in this magazine.

The ultimate course in ZX81 BASIC programming.



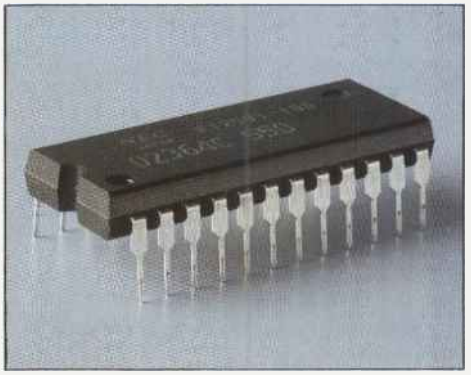
Some people prefer to learn their programming from books. For them, the ZX81 BASIC manual is ideal.

But many have expressed a preference to learn *on* the machine, *through* the machine. Hence the new cassette-based ZX81 Learning Lab.

The package comprises a 160-page manual and 8 cassettes. 20 programs, each demonstrating a particular aspect of ZX81 programming, are spread over 6 of the cassettes. The other two are blank practice cassettes.

Full details with your Sinclair ZX81.

If you own a Sinclair ZX80...



The new 8K BASIC ROM used in the Sinclair ZX81 is available to ZX80 owners as a drop-in replacement chip. (Complete with new keyboard template and operating manual.)

With the exception of animated graphics, all the advanced features of the ZX81 are now available on your ZX80 – including the ability to drive the Sinclair ZX Printer.

sinclair
ZX81

6 Kings Parade, Cambridge, Cambs., CB2 1SN.
Tel: (0276) 66104 & 21282.

GEMINI VIDEO CARD

Nick Laurie examines a high-powered, intelligent board for the Nascom micro.

ONE OF the leading lights in the Gemini Microcomputers series of 80-Bus Multiboards, the Intelligent Video Card, uses a dedicated Z-80A CPU to control a keyboard, VDU and light-pen as well as providing more than 50 features. Gemini's 80-Bus resembles, and is generally totally compatible with, Nascom's Nasbus.

A number of manufacturers are producing 8in.-by-8in. cards suitable for this bus, but there can be little doubt that Gemini's Multiboard range is among the most comprehensive and compatible. After all, with John Marshall, Paul Greenhaulgh and various others who worked on the original Nascom, the experience behind the Multiboard designs is second to none.

Exotic applications

The IVC provides a sophisticated interface which, although provided with very comprehensive software for its on-board Z-80A, can be reprogrammed by the user to offer even more facilities. Plenty of spare RAM is available to hold user programs while the Bytewide socketing allows ROM and RAM to be interchanged for even more exotic applications.

As standard, it has a 128-character keyboard buffer which is interfaced to a socket suitable for most seven-bit ASCII keyboards. We tested it with a Nascom 2 keyboard and was pleased to find that it worked instantly and without problems. Connection is via a 16-pin IDS plug.

The video interface is, naturally, the most comprehensive part of the board; it provides a peak-to-peak 2V composite video signal capable of driving even the most overworked monitors. When used with a good-quality monitor, there is nothing one could fault in the quality of the final image.

Although the board defaults to 26 lines of 80 characters or 26 lines of 48 link-selectable characters, it can be programmed to give any number of row and column combinations, character heights, interlace and skew factors, cursor types and screen widths. The various combinations are easily selected by loading the required hexadecimal values to the cathode ray tube controller (CRTC) registers.

A number of the more common formats are selectable using escape sequences typed directly through the keyboard. The more technically-minded may be wondering how a crystal-controlled clock can provide all the possible timing combinations required. The answer is simple: there are two clocks, one crystal and the other a variable oscillator. There is no modulator on-board so this card will not drive a domestic TV set.

A five-pin socket allows connection of a range of light pens — Gemini will be producing one of its own very soon — and the software to read them is already present in the monitor. The outputs are +12V, +5V and ground, while the inputs are for a cleaned-up phototransistor output and a switch.

Simple interface

By keeping this interface as simple as possible, Gemini has made it possible for all but the most ham-fisted to construct a suitable pen without having to go out and buy yet more expensive peripherals.

There are two character generators. A PROM carries 128 of the usual alphanumeric and graphic characters, while a RAM chip can be automatically loaded — again among the escape codes — with the character set for minor modifications or with the inverse of the standard set.

Provision is made for creating, storing and down-loading characters of your own design. The Bytewide socketing allows you to replace the ROM with RAM or vice versa for even greater versatility.

Data is transferred between the IVC and the host computer via three I/O ports addressed through the 80-Bus. The first transfers data, the second carries the various handshake signals, and the third is used by the host system to reset the IVC. A 256-byte PROM is provided to assign the ports — 0 to 7, B1, B2 and B3 by default. The documentation explains how to recode this for use with other port addresses.

This PROM also provides the decoding required to maintain compatibility with Nascom systems. The whole board usually functions satisfactorily when plugged into a Nascom 2, though there is one exception. Nascom monitors such as Nas-Sys are suited to the memory-mapped screen system and rely heavily on screen-line mapping for user input.

Using the IVC — which is, in effect, a separate input/output terminal — means turning your back on most existing Nascom software unless you are willing to rewrite some of your input routines. However, if you have already taken the plunge and turned to CP/M, you will already have the answers to this problem and will find that the IVC card is one very good answer to overcoming the VDU limitations of the Nascom.

The table shows a summary of the standard functions available with the IVC. However, as with any complex product this table can do little more than sketch an outline of this outstanding device. The full documentation runs to nearly 40 A4 pages — and even then it barely touches on the possibilities.

The documentation is thorough though not particularly well presented. Written by engineers for engineers, it is definitely not for the faint-hearted.

General:
Bell
Backspace, linefeed, carriage return
Cursor up, down, left, right, on, off, define
Cursor co-ordinates — position cursor or return values

Character set
Define character
Define character set
Construct block graphic set
Invert character set
Duplicate and modify character set

Screen formatting:
Select format — 80 or 48 wide or user-defined
Define format
Blank, unblank screen
Invert, normal video
Default to one of two character sets
Memory lock on, off — for fixed headings

Screen editing:
Insert, delete line
Insert, delete character in line
Insert, delete character in screen
Clear to end of line, end of screen
Return contents of current line
Clear screen

Block graphics:
Set, reset, test a point

Keyboard:
Get keyboard status
Get keyboard character
Get keyboard line

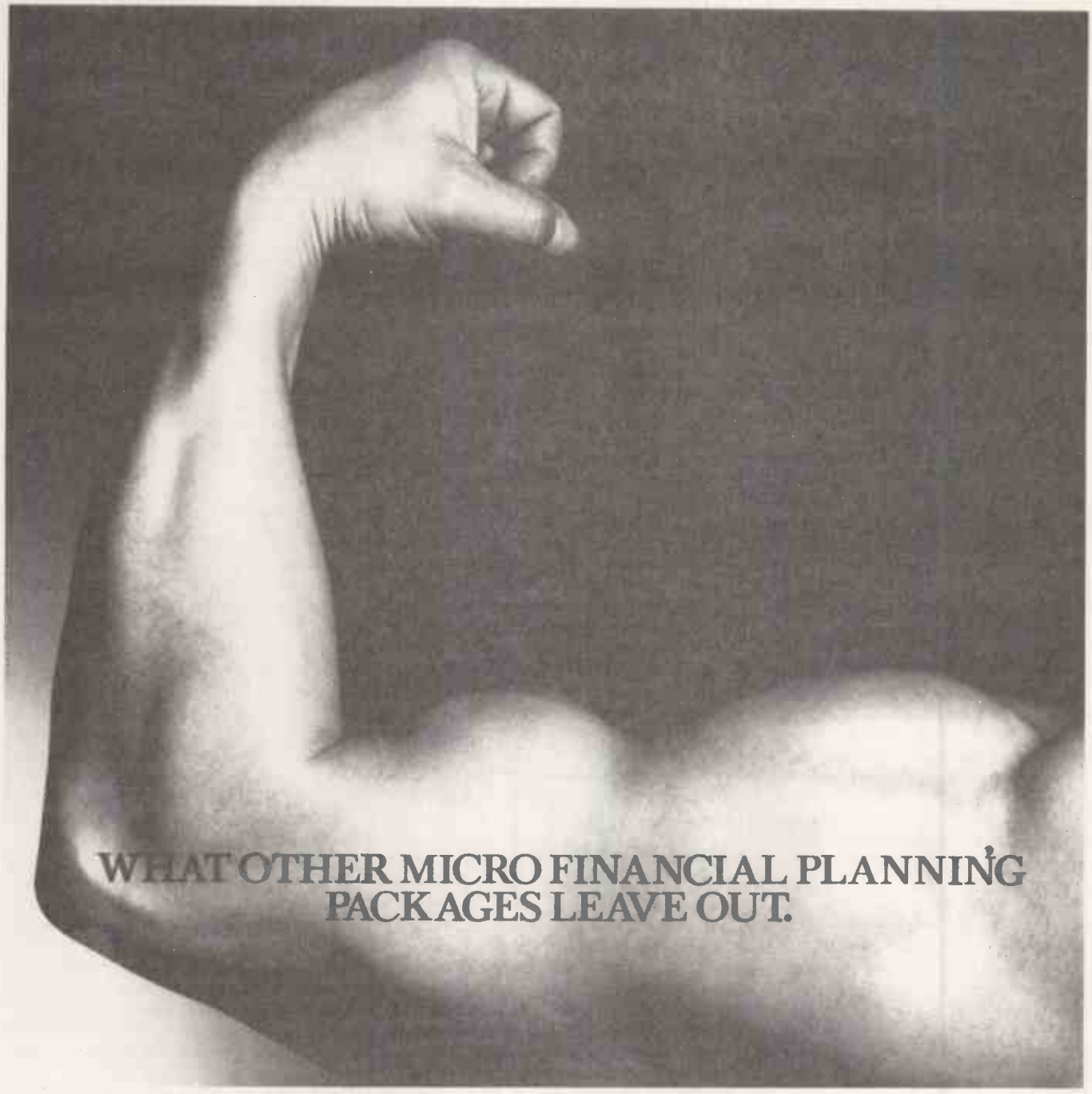
Miscellaneous:
High-speed write to display
Load a user program
Execute a user program
Return light-pen co-ordinates
Return version number

The standard operations available from the intelligent video card.

Conclusions

- **At £161 including VAT, the IVC represents good value for money, providing, as it does, the equivalent of a complete VDU terminal on a single 8in.-by-8in. board.**
- **It is hardware-compatible with Nascom systems, but some rearrangement of the Nas-Sys input routines is required if the current Nascom software library is to be maintained.**
- **A short length of Veroboard for a bus, a Gemini CPU card and RAM card, together with this IVC, provide one of the least expensive ways for users to build themselves a very sophisticated computer system.**

● Circle No. 153



At Comshare, while we're developing our software, we're also developing our biceps.

(As we're No. 1 suppliers of financial packages in Europe, it's important to have both.)

Fastplan is our powerful new menu driven micro based financial planning system, at a cost effective £395.

However, add 24 offices throughout Europe, custom-built training schemes, a free enhancement service, as well as our Helpline and you'll appreciate that brains aren't everything.

Muscle counts as well.

James Lascelles, Comshare Ltd.
32-34 Great Peter Street, London SW1.

I want to know more now. Please send me your Fastplan Factsheet.

Name:

Address:

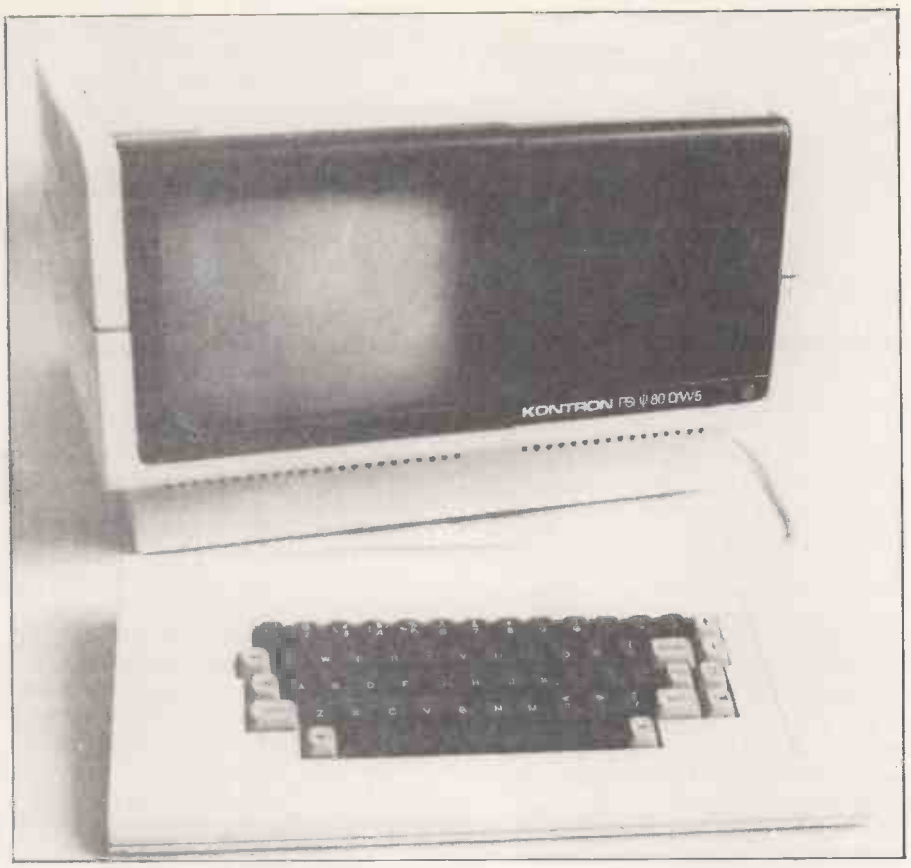
FASTPLAN FROM COMSHARE

Making the computer make sense.

● Circle No. 154

Hard disc and software in Kontron's price

With a wealth of software already imprinted on its mini-Winchester, the Kontron parades major attractions for the business user. Mike Hughes conducts the inspection.



KONTRON ELEKTRONIK of Munich, West Germany, manufactures a range of computers carrying the prefix PSI-80. Variations within the range depend on whether or not disc drives are supported and, if so, which types. The PSI-80D/W5 is based on a Z-80A microprocessor operating at 4MHz. It has 64K of dynamic RAM, up to 16K of PROM or EPROM — it takes the 2716 type — and 16K of video-display memory, the equivalent of eight screen pages. Memory blocks are selected into or out of the system architecture via I/O channels.

Hardware layout

Standard peripheral devices on the D/W5 are a parallel-interface keyboard, which is separate from the main console, and a medium-persistence, green-phosphor 9in. display built into the console. A 5Mbyte mini-Winchester hard disc is built in, as is a single, soft-sectored floppy-disc station, configured to take single-sided double-density discs — 77 tracks, 16 sectors per track and 256 bytes per sector to provide 308K of storage.

In addition to the keyboard socket on the rear of the console there are terminations for serial and parallel interfaces driven from the internal S/O and P/O chips. One such termination is pin-configured to support a Centronics-type printer.

Serial baud rates can be software-selected via the internal CTC chip; by altering the position of an internal jumper, the rate can be driven by an external clock for synchronous applications. The video signal to the internal display is paralleled out to an auxiliary socket to allow an external video monitor to be used if required.

The front panel of the console carries the display, the mini-Winchester, the floppy drive, an on/off switch and a Master Reset panic button. Apart from these two fundamental controls all other functions are reached through the 58-position QWERTY keyboard. There is no numeric key pad.

An internal loudspeaker generates a half-second bleep which is software-triggered via a monostable from one bit of the status port. The frequency of the bleep can be selected by software through the internal CTC channel.

The master computer board inside the console contains the CPU, main memory, I/O devices and clocks. It is set neatly within the base of the unit. Removing the base cover gives easy access to the slide-on jumpers which can be used to alter the hardware configuration. Though this should be a simple operation, the board lacks silk-screened component designations and there is no drawing of the board layout in the hardware manual.

Ample software

Connections are taken from the main board through ribbon-cable links to the main section of the console where the video-display module is to be found together with the tube, which appears to be of Japanese origin. The power supply, which is well protected from fingers, the mini-Winchester and a Micropolis 5.25in. disc drive are housed in the same unit. All this is neatly laid out, leaving ample room for a multi-slot motherboard frame which carries an ECB busbar designed to take single- or double-width Eurocards. The busbar is buffered to take up to seven standard or 30 LS TTL loads. The positioning of the ECB expansion frame should make it quite easy to extend the busbar externally via an extra ribbon cable.

Kontron's own organisation, based at St Albans, Hertfordshire, markets the machine in the U.K. The system supplied for review was priced at £6,663, including a wealth of software already imprinted on the mini-Winchester. Kontron tells us that buyers receive over 330K of system and utility software which includes the KOS operating system, Kontron's own 17K Basic and a 10K editor. Together with the operating system's command files, these three account for about 190K of the software; the balance comprises graphics and I/O drivers, together with a handful of sample "fun" programs written in Basic.

Other utilities are available free of charge if the user wishes to drive alternative peripherals such as digitising tablets, light pens, digital plotters or any other peripheral-interface ECB extension cards which Kontron supplies. We were supplied with a number of CP/M programs which Kontron normally sells as extras. These include MBasic, Pascal, Fortran, Cobol, Assembler and WordStar, which the system quite happily supported, justifying Kontron's claim that KOS is upwards-compatible to CP/M version 1.4.

Although the price buys much more

(continued on next page)

(continued from previous page)

software than most manufacturers supply, as well as over 5Mbyte of hard disc, it must be remembered that it did not include a printer. The system thus appears rather costly compared with competing small office systems, though it does have a number of built-in overheads. While they may not be required immediately, these features allow ample provision for future expansion.

Operating system

Kontron has written KOS to implement CP/M so as to retain access to the wide variety of software written in that system. At the same time the manufacturer claims to have incorporated state-of-the-art improvements to allow multi-tasking and the support of a wider range of mass-storage media through I/O channels. Up to 10 different varieties can be interfaced, including single- and double-density floppies, Winchesters, and bubble memories. Each medium can have a capacity up to 64Mbyte and file size can range from zero to eight megabytes. KOS also provides secrecy through the optional use of hidden passwords and invisible or secret files.

Like CP/M, KOS has a number of internal commands, though they are more numerous and very different in style and format. The more complex utilities are run as external commands from .COM files; there are 23 such commands which carry out similar functions to CP/M utilities but, again, are of different format.

Internal commands require single-letter keywords followed, if necessary, by specific parameters defining addresses, the names of I/O drivers, the disc-drive number, etc.

- A — allocates memory to prohibit use by user or system programs.
- C — reverses the function of the Shift key.
- D — frees memory which has previously been allocated.
- I — lists a short form index of files or file types on a specified memory medium.
- M — displays the number of the current master medium — disc drive — or assigns a new drive number.
- N — initialises a named I/O driver.
- P — selects one of the eight pages of the video display.
- R — allows a string of command macros to be stored in memory and subsequently executed in the sequence specified simply by typing "R".
- S — saves a specified number of 128byte blocks to a specified medium number.
- X — executes a .COM program after it has been initially loaded; it is useful for repeating an operation without having to re-enter the file name.

The documentation is aimed squarely at the knowledgeable user and will not be of much help to the non-technical. Even if you accept that this approach is justified, the documentation has a number of shortcomings. Although presented in English it has obviously suffered somewhat in translation from the German original which makes for difficult reading at times. The meaning is unclear in places.

The Technical Manual describes the intrinsic KOS internal and external commands as well as the drivers which are supplied as utility software. Several of these are used to control the use of high-resolution graphics on the internal display. The manual goes on to describe the Kontron Debugging Module, KDM, which is a near equivalent to CP/M DDT, and then goes into considerable detail on the inner workings of KOS. This is heavy going even for the most determined of readers. The final section deals with the software-to-hardware interface and gives details of the memory architecture, designation of I/O ports and pinning of the external sockets.

This section gives no details of circuitry or board layouts, and there is no components list. There are four unmarked sockets on the rear of the console unit, and a thorough search of the manual failed to reveal any information as to which is which. The only socket referred to is that for the keyboard which, fortunately, is identified in the section dealing with the initial setting up.

The User's Manual deals very briefly with initial setting-up, and is aimed at the user with floppy discs. There are no obvious instructions on a system using a mini-Winchester. It then describes how to use the text editor and goes on to describe the instruction set of Kontron's own PSI/Basic in a section which is well peppered with short examples of the keywords used in their correct syntax.

Most information the technical user might need is contained somewhere within the manuals, but they are not clearly laid out and omit a considerable amount of important hardware information. The User's Manual will be of very little help to the inexperienced user. Unless the software backroom boys generate some automatic loading and running programs, available off the shelf, this will seriously limit the machine's appeal.

Conclusions

- **The hardware is neat and tidy, and seems well designed. Flexible expansion is possible by adding Eurocards.**
- **More than 5Mbyte of storage is available on the integral mini-Winchester unit — an impressive capacity for a desk-top machine.**
- **The software of the KOS disc-operating system is reliable, but only an experienced specialist will be able to make the most of its refinements.**
- **KOS is upwards-compatible to CP/M to provide a wide range of software for the more down-to-earth user.**
- **At £6,663 the Kontron is rather expensive compared with other small office systems, though for some users the built-in capacity for expansion may offset the extra cost.**

GUESTEL THROUGH THE POST

Apple III System	2545:00
Apple II	P.O.A.
Disk Drive with controller (DOS 3.3)	349:00
Disk Drive	289:00
BMC 12" Green Monitor	149:00
NEC 12" Yellow monitor	170:00
OKI Microline 80 printer	275:00
Epson MX 80T printer	349:00
Silentype Printer	195:00
Centronics 737	325:00
Centronics Parallel Interface	69:00
16K RAM card	89:00
Visicalc 3.3	105:00
Colour card (inc. modulator)	92:00
Disks (10)	21:00
DOS Tool Kit	39:00
Apple World	35:00
40 Disk lockable tray	20:00
Upgrade Kit	39:00
Gorgon	21:00
Olympic Decathlon	15:50
Monopoly	16:50
Pool	19:00
Space Eggs	15:50
GUESS WHO? Guestel Sweat Shirt	5:00

All prices exclusive of VAT.

GUESTEL ORDER FORM

Goods required:

Total cost £

VAT at 15% £

Add £1 P&P to orders under £10

Total £

Payment must accompany order

Date:

Name:

Address:

Telephone:

GUESTEL LIMITED
15 GRAND PARADE BRIGHTON
EAST SUSSEX BN2 2QB

● Circle No. 155 ▶

FOUR GOOD REASONS FOR CHOOSING GUESTEL

1. **The Systems** – Whatever your micro computer hardware or software requirements, Apple systems can meet them and we can supply them to rent or buy. Visit our showrooms in London, Brighton and Bristol or use our nationwide mail order service – one of the largest and most efficient in the country.
Guestel provide sales, service and an in depth knowledge of Apple systems. We buy bigger so you can buy cheaper.

2. **The Consultancy** – Micro computer systems are simple to use once you know how. But how do you learn when so much of the so-called advice is in confusing computer jargon? Come to us. We talk plain English. Quite simply, we will help you to identify your particular needs for hardware, software and support services – then we'll match them with Apple systems.

3. **The Service** – Immediately you come to us with your needs you'll get a personal service. Whatever your requirements, we respond right away. And once your equipment is installed our reliable back up service ensures that help is aways on hand when you need it. We operate a two tier maintenance agreement, with a 24 hour call out service. We also have an in house engineering facility and a telephone enquiry service to cope with emergencies.

Our fast, efficient mail order service will take care of your additional requirements and our offices are within easy reach.

4. **The Know How** – Some of Britain's leading companies have come to us for help in developing major custom built micro computer linked systems – your guarantee that we have the depth of technical knowledge and the experience to help with your needs, large or small.

GUESTEL

EXPANSION THROUGH EFFICIENCY

8-12 NEW BRIDGE STREET LONDON EC4V 6AL TELEPHONE 01 583 2255

37 QUEENS SQUARE BRISTOL 1

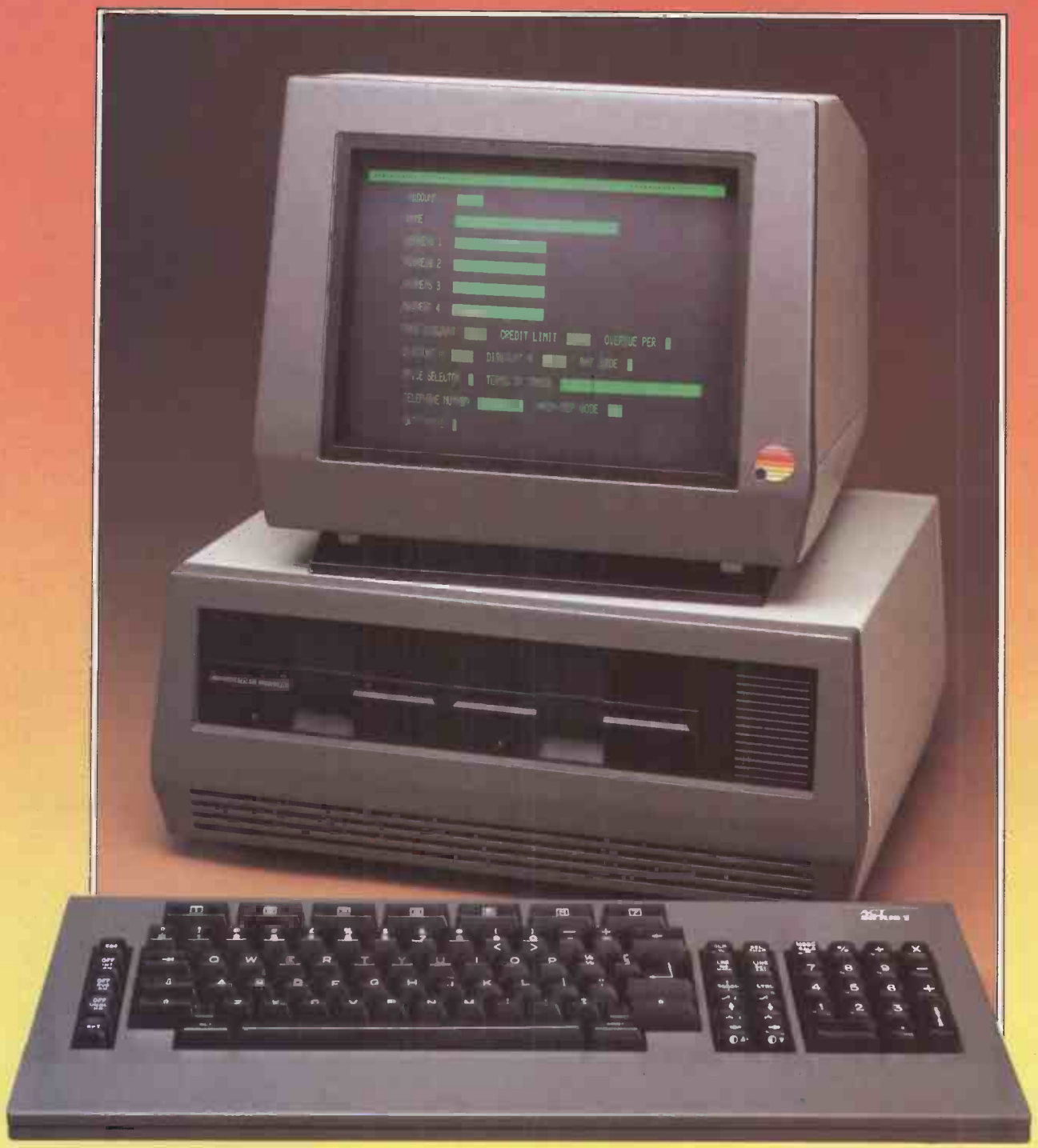
15 GRAND PARADE BRIGHTON EAST SUSSEX BN2 2QB TELEPHONE 0273 695264

AUTHORISED APPLE DEALER AND LEVEL ONE SERVICE CENTRE

apple® APPLE III NOW AVAILABLE

® Apple is a trademark of Apple Computer Inc., Cupertino, CA, USA.

SEEING IS BELIEVING



ACT Sirius 1

NEW ACT SIRIUS 1
Minicomputer Performance. Personal Computer Price.
16 bit processor: £2,395

The best price/performance ratio you've ever seen on a personal computer.

	ACT Sirius 1	Typical Personal Computers	Typical Business Systems
Memory	**128K-1024K**	32K-64K	48K-256K
Disk Capacity	**1.2Mb-10 Mb**	140K-1Mb	1.2Mb-10 Mb
Processor	**16 bit**	8 bit	8 bit
Operating Systems	**CP/M-86, MSDOS**	CP/M or Machine Specific	Usually Machine Specific
Languages	**Microsoft BASIC Compiled BASIC COBOL PASCAL FORTRAN**	Microsoft BASIC perhaps one or two others, eg PASCAL	BASIC and perhaps one or two others
Price	**£2395**	£1800-£3000	£4500-£8500

ACT Sirius 1 is a new generation personal computer. Quite simply, it has no competition at the price.

It's the first personal computer developed from the outset for business and professional use.

It's launched with more software than anything before it.

It's supported and distributed solely by ACT — the biggest name in personal computer software.

And it's developed by Chuck Peddle, formerly of Commodore and generally regarded as the father of personal computing.

SOFTWARE SPELLS SUCCESS

ACT Sirius 1 has more software than any other new personal computer:

A choice of two operating systems — CP/M-86 or MSDOS, from Microsoft.

For Software Houses

The ACT Sirius 1 has a language for you. Microsoft BASIC 80, two BASIC Compilers, two COBOLS, PASCAL and FORTRAN.

For Applications

Wordstar, Mailmerge, Pulsar, SuperCalc and MicroModeller — all the best sellers.

And the ACT Sirius 1 can run any software written for CP/M — that means hundreds of specialised packages.

THE BODY IN QUESTION

Ergonomics play a vital part in the design of ACT's Sirius 1.

The screen tilts and swivels to suit the user and glare is eliminated.

The display is razor sharp; and the brilliance and contrast can be adjusted using keys on the low-profile detachable keyboard.

STAYING OUT IN FRONT

The ACT Sirius 1 is designed to keep you out in front. Winchesters, networks, multi-user facilities and colour graphics are all scheduled during the next twelve months. And all at the same record-breaking price levels of the ACT Sirius 1.

SEEING IS BELIEVING

The ACT Sirius 1 goes through the most exhaustive quality control process of any microcomputer — including the much vaunted Japanese products.

ACT Sirius 1 has been successfully operating in testing field trials for over 6 months already. And now it's at your nearest ACT Dealer — ready to revolutionise your ideas on personal computers.

Clip the coupon for literature. Better still, call David Low now on the hot line 021-454 8585, get the name of your nearest dealer and see a demonstration as soon as you can — because seeing is believing.

PC 3

To: ACT (Microsoft) Ltd, FREEPOST, Birmingham B16 8BR.

☐ Please send a brochure and name of my nearest dealer

☐ I am interested in dealership — send the dealer pack and ask your sales director to contact me.

Name_____

Position_____

Company_____

Address_____

Telephone_____

ACT No.1 in Total Computing.

● Circle No. 156

75

Next to keeping all your data on Verbatim Datalife™ flexible disks, the best thing you can do for your computer or word processor is to keep it running clean and error-free.

And the way to do just that is with Verbatim's new Datalife Head Cleaning Kit. It can remove up to 90% of the debris contaminating your drive heads. Dust, dirt and debris that causes data loss and errors, hinders system performance.

Quick and easy to use

All you have to do is remove a Cleaning Disk from its protective pouch, put the disk in the special jacket, insert it into your drive and turn it on.

In just 30-60 seconds, your drive heads are cleaned.

Cleaning, with no cleaning mess

With your Datalife Head Cleaning Kit there's no hit-and-miss applying solvents that can splash and spill.

What's more, with Datalife Cleaning Disks every time you clean your heads, you can do it with a fresh, clean, disposable disk.

Cleans both Single and Dual Head Drives Safely

There's no worry about damaging your system with Datalife Cleaning Disks. And you can use them on single or dual head drives.

Protect your investment

The Datalife Head Cleaning Kit will help you guard against data loss, errors, and degradation of system performance because of debris contamination.

So if you want your data back verbatim, keep it on Verbatim disks. And keep your disk drives clean with Verbatim's Datalife Head Cleaning Kit.

Verbatim S.A.
P.O. Box 3
CH-1211 Geneva 19 Switzerland
Telephone: (022) 31-90-55
Telex: 22647 ITGE CH

BFI Electronics Ltd.
516 Walton Rd.
West Molesey – Surrey KT8 0QF
Telephone: (01) 941 4066
Telex: 261395

Willis Computer Supplies Ltd.
South Mill Rd.
Bishops Stortford – Herts CM23 3DN
Telephone: (0279) 506491
Telex: 817425

Introducing the second best thing you can do for your computer.

Verbatim®

©1981 Verbatim Corp.
Datalife is a trademark of Verbatim Corp.

76

We test two contrasting packages for Apple microcomputers: a utility to help draw and manipulate shapes, and a structured Basic pre-compiler.

SHAPE MANAGER

by Michael Thorne

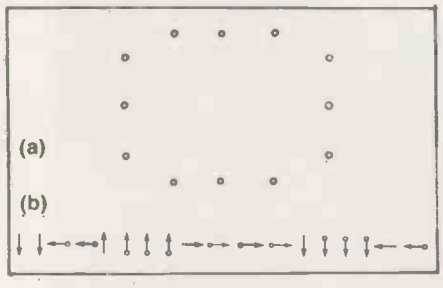
THERE ARE two ways of presenting graphics during a program. You can either arrange for the user to watch the picture drawn line by line as the program runs, or you can fill the screen with a picture from memory all in one go. In the Apple "Lemonade" demonstration program, for example, 12 lines have been slowly drawn on the screen before anyone watching realises that the developing picture is of the inside of a living room. Rapid drawing is perhaps most useful when animination is required.

The only remaining problem is establishing the pictures, or some representation of them, in memory in the first place. Until we can all afford light-pen or graphic-tablet accessories, utility programs which enable pictures to be stored and reproduced easily will be particularly valuable. The Sinta Shape Manager is such a utility designed to ease the burden of creating shape tables for the Apple II of ITT 2020 computers.

The Basic for these machines has five special commands which enable shapes to be manipulated: Draw, XDraw, Rot, Scale and ShLoad. Before these commands can be used, a shape must be defined by a shape definition. Then you can ShLoad and Draw it, rotate the shape and scale it up or down as necessary.

The Sinta Shape Manager provides help in the shape-creation stage. In order to draw a shape in the conventional manner it must first be converted into a series of plotting vectors — see figure 1. The vectors must then be converted to hexadecimal code and the results stored in memory.

Figure 1. In order to draw the shape (a) by conventional means, you have to convert it to a set of vectors (b) which are then plotted.



With the Sinta product you only need to draw the high-resolution shape on the screen by moving a dot around with the games paddles. The path traced out by the dot forms the shape which the system automatically codes into memory.

You can change your mind and alter the design at any stage, calling into play any one of more than 30 functions to help you. Facilities include the computer generation of the rest of a picture after you have drawn part of it. For example, to draw the picture of two men and a flag, you move the dot around to produce the basic shapes, then ask the system to duplicate the first, and glue together the result with the flag shape at the appropriate point. For 10 pin men you simply duplicate the original nine times.

Very complicated shapes can first be traced using an acetate sheet and pen provided. The tracing is placed over the computer's display screen so that the traced image can be followed with a screen dot, thereby transferring the shape to memory.

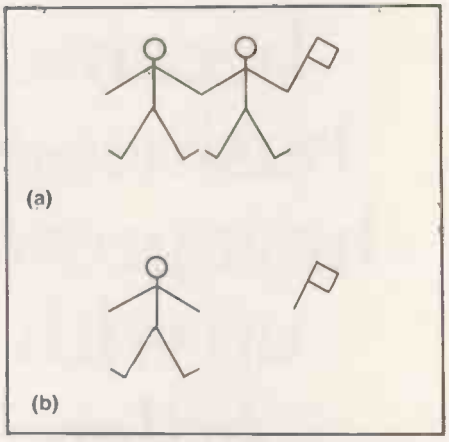


Figure 2. The finished picture (a) can be constructed automatically from its two elements (b).

The software is robust, and contrives to have all the commands documented on the screen at the press of a CTRL-C or two. Sound from the speaker is used to assist you in a novel and enterprising way. Built-in utilities generate standard shapes such as regular polygons and ellipses.

If you can afford a graphics tablet, the Sinta Shape Manager will not be of interest. If not, the system can save hours of programming effort and enable you to enhance the graphics aspect of your programs considerably.

Conclusions

- **This is an impressive first package from Sinta, available for about £60, which provides easily-accessible graphics for your programs.**
- **Commands are documented on the screen by simple keystrokes.**
- **The manual is easy to follow and lively.**

APLUS BASIC

by Kieron Leach

STRUCTURED LANGUAGES have their enthusiastic advocates as well as equally firm detractors. Aplus, from Sensible Software, is a pre-compiler which allows you to write programs in a structured Basic. It is supplied on a disc or tape which, in addition to the pre-compiler itself, contains a set-up program, a demonstration program in structured Basic and a game called Surround, also written in structured Basic.

To start the system up you simply put the disc in drive 1 and type PR#6. Alternatively you can run the program called Hello Aplus which is on the disc. This set-up program will ask you if you have Renumber, the DOS 3.2 version, and a program called AOPT on the disc. These are not supplied on the disc so you must either transfer them on to the Aplus disc or put structured Basic on a disc containing them.

Once you have answered the questions, the program tells you it is starting the system up. It will eventually end by telling you which commands you may use. The only two you can always use are:

&L — indented listings
&C — convert structured Basic to Applesoft Basic

Others may be available, depending on whether you have Renumber or AOPT.

Having established a system with structured Basic, what can you do? The new functions it provides are listed in table 1, and with them you can dispense with the Goto statement. Unfortunately the manual merely lists the new functions and briefly explains how to use them, but gives no good examples of a structured Basic program showing how they fit together. The sample program on the disc is no help either.

The pre-compiler provides 11 extra error messages:

(continued on page 79)

◀ ● Circle No. 157

Trust Alphatronic because businesses have grown up with Adler.

The Alphatronic – the only microcomputer backed by Adler's impressive pedigree of technical excellence and wide experience of business requirements. Using the latest available technology, it's got the businesslike performance and famous reliability that you'd expect from Adler.

It offers a wide range of solutions to business problems, including Accounts, Stock Control, Payroll, Word Processing and many more.

Need help or advice? Just call your Adler dealer and he'll do all he can for you – fast!

Businesses have grown up – and are still growing – with Adler.

The Alphatronic business microcomputer at £2095 includes:

Alpha-numeric keyboard
Floppy disk storage
12" visual display screen
Information retrieval program
All cables and connectors for immediate use
Printers from £560.

Prices exclusive of VAT.

TA TRIUMPH ADLER

Triumph Adler (U.K.) Ltd.,
27 Goswell Road, London EC1M 7AJ.
Telephone: 01-250 1717.

Please give me more information on the the Adler Alphatronic Microcomputer.

PC 3/82

Name
Company
Address

Telephone
DP1

ANOTHER TRIUMPH FROM ADLER

● Circle No. 158

(continued from page 77)

Program too big
Stack empty
Missing FIN
Missing ELSE
Missing FOR
Missing NEXT
Missing CASE/SELECT
Unmatched FIN or ELSE
Undefined DO
Unreferenced TO
Duplicate TO

Error messages are generated either when you list the program using the &L command, or try to convert it. As it lists, and before it converts a program, it checks for errors and any which are found are flagged. No conversion will occur if there are any fatal errors.

The pre-compiler expects a one-to-one relationship of For-To statements to Next statements, and if that is not the case it signals an error. However since you may want several Next statements to each For-To, or vice versa, this error will not prevent conversion. The other non-fatal error is an unreferenced procedure — i.e., one which is not called — though this will always be an unwanted error.

Zombie menace

The best way to learn a new computer language is to write a program in it; I decided to write a game program to illustrate Aplus Basic. In the game of Zombie you are stuck on an island full of potholes and zombies. The zombies come straight for you, trying to eat you; to survive you must lure them into the potholes.

The game is in real time so you must think and act fast to survive. The keys to operate it are:

W — go up,
A — go to the left,
S — go to the right,
Z — go down,
D — jump at random to another free space on the screen; these jumps are limited in number
And any other key to stop.

Since the program is in a block structure it is quite easy to see what is happening. The first section starts the game and

Zombie.

```
←&L
10   HOME
11   E= 1
15   WHILE (E= 1)
17   : CLEAR
20   : "DO  SETUP"
25   : "DO  DELAY"
30   : "DO  GAME"
40   : "DO  END"
50   ::FIN
60   END

--------------------------------

100  "TO  END"
110  : "DO  LINES"
111  : WHEN (Z= 0)
112  : : PRINT "CONGRATULATIONS, YOU WON !!"
113  : ::FIN
114  : ELSE
115  : : PRINT "BAD LUCK - YOU'RE DEAD !!"
116  : ::FIN
119  : PRINT
120  : PRINT "DO YOU WANT ANOTHER GAME (Y/N)..?";
130  : GET A$
140  : IF A$= "Y"THEN 170
150  : IF A$( ) "N"THEN 130
160  : E= 0
165  : RETURN
170  : E= 1
180  ::FIN
```

(Listing continued on next page)

IF (LE) Commands FIN	
UNLESS (LE) Commands FIN	
WHEN (LE) Commands FIN	
ELSE Commands FIN	
WHILE (LE) Commands FIN	Here the condition is checked before the loop is carried out and if it is false the loop is not executed.
UNTIL (LE) Commands FIN	Here the check is made after the loop has been carried out, so it will always go through the commands once.

SELECT (Variable) (Value 1) Commands FIN (Value 2) Commands FIN (OTHERWISE) Commands FIN FIN	SELECT (B) (1) Commands FIN (2) Commands FIN (OTHERWISE) Commands FIN FIN There can be more than two check values against the variable; OTHERWISE is also optional.
CASE (LE1) Commands FIN (LE2) Commands FIN (OTHERWISE) Commands FIN FIN	CASE (A = 1) PRINT "A = 1" FIN (A = 2) PRINT "A = 2" FIN (OTHERWISE) PRINT "A DOES NOT EQUAL 1 OR 2" FIN FIN
"DO procedure"	
"TO procedure" Commands FIN	

Commands are any legal Applesoft commands or any other structured Basic commands; LE is a logical expression, such as A = 6.

Table 1. The new functions which are available in Aplus structured Basic.

runs while E, the game indicator, is 1. It calls the set-up section, then a delay, then the game itself and then the end section.

The End block calls a routine called Lines to print three lines. If there are no more zombies left, it prints out congratulations, otherwise it prints out commiserations. After finding out if you want another game it sets the game indicator accordingly.

The Lines routine just clears the screen and prints out three lines. Game is a very simple block which calls the Move routine to move you if there are some zombies left, and then calls Zombie to move the zombies.

The Move routine looks to see if you have hit a key; if you have, it sets the move variables, X1 and Y1 to zero; then it sees which key you hit and sets the move variables accordingly. If you want to make a jump, and have some left, it decrements the number of jumps, wipes you out with Wipe, then places you back on the board using First Set.

Setup sets up the initial game. It clears the screen, puts a border of potholes around it, decides upon a random number of zombies then places these on the screen in the array, using Place to find unused spaces. After doing the same for potholes, it puts you on the screen using First Set, then decides how many random jumps you can have.

Place finds a free space in the game array; Delay causes a slight delay; Wipe wipes you out of the array and off the screen; and First Set decides on a place to put you, using Place, then puts you on the screen. Draw Zombies puts a zombie on the screen and in the array.

Program conversion

As you can see, programs that are well structured are easier to follow than unstructured ones. To convert a program in structured Basic you type &C. You are then asked if you have saved the program. If you say no, then it will not be converted. This is a useful precaution since you cannot convert from Applesoft back into your original program. If you have saved it, the pre-compiler will spend some time checking the program for any errors. If no fatal errors are found, conversion will take place, and the line numbers at which blocks occur will be printed on the screen.

The Applesoft object program differs considerably from the structured original. Lines containing non-Applesoft commands are converted to legal commands. Numerous colons are added to identify these lines. The pre-compiler's conversion of If-Then statements is surprising: for example E = 1 becomes NOT (E = 1) though E <> 1 would be a simpler way of

(continued on next page)

(continued from previous page)
representing the same result. Conversion of complex logical expressions appears to be beyond the system's scope.

Converted programs run with no errors. However, the process of converting the program, finding a logic error when you run it, then reloading the structured version to correct the error, then saving it again before converting it can be tedious. If the pre-compiler could run in an interpretative mode it would be easier to find and correct any logic errors.

Conclusions

● Aplus is distributed in Britain by SBD Software. It costs about £20 plus VAT. It is good value for money for Apple users who need access to a structured language.

● The indented listing is a useful feature, making programs easier to read than normal listings.

● The structured Basic commands allow programs to be written without Gotos, but you cannot pass parameters from one procedure to another.

● The software is let down by its barely-adequate documentation, which lacks a good example of a structured program.

(Listing continued from previous page)

```
200  "TO  LINES"
205  : POKE 34,0
206  : HOME
210  : PRINT
220  : PRINT
230  : PRINT
240  ::FIN

300  "TO  GAME"
310  : WHILE (Z( ) 0)
320  : : "DO  MOVE"
330  : : "DO  ZOMBIE"
340  : ::FIN
350  ::FIN

400  "TO  MOVE"
410  : IF (PEEK (- 16384)) 127)
412  : : X1= 0
414  : : Y1= 0
420  : : GET A$
430  : : IF A$= "W"THEN Y1= - 1
440  : : IF A$= "A"THEN X1= - 1
450  : : IF A$= "S"THEN X1= 1
460  : : IF A$= "Z"THEN Y1= 1
470  : : IF (A$= "D"AND JU( ) 0)
475  : : : JU= JU- 1
480  : : : "DO  WIPE"
490  : : : "DO  FIRST SET"
510  : : : RETURN
520  : : ::FIN
530  : ::FIN
600  : "DO  WIPE"
630  : X= X+ X1
640  : Y= Y+ Y1
650  : IF A(X,Y)( ) 0THEN 40
660  : HTAB X
670  : VTAB Y
680  : A(X,Y)= 3
690  : PRINT "*";
700  ::FIN

1000 "TO  ZOMBIE"
1010 : FOR I= 1TO Z1
1015 : : IF (A(I)( ) 0)
1020 : : : XA= X(I)
1030 : : : YA= Y(I)
1040 : : : "DO  MOVE ONE"
1050 : : : X(I)= XA
1060 : : : Y(I)= YA
1065 : : ::FIN
1070 : ::NEXT
1080 ::FIN

5000 "TO  MOVE ONE"
5010 : A1= SGN (X- XA)
5020 : B1= SGN (Y- YA)
5030 : HTAB XA
5040 : VTAB YA
5050 : A(XA,YA)= 0
5060 : PRINT " ";
5070 : XA= XA+ A1
5080 : YA= YA+ B1
5090 : IF (A(XA,YA)= 0)
5100 : : "DO  DRAW ZOMBIE"
5140 : : RETURN
5150 : ::FIN
6000 : IF (A(XA,YA)= 2)
6010 : : XA= XA- A1
6020 : : YA= YA- B1
6030 : : "DO  DRAW ZOMBIE"
6040 : : RETURN
6050 : ::FIN
7000 : IF A(XA,YA)= 3THEN 40
7010 : Z= Z- 1
7020 : XA= 0
8000 ::FIN

10000"TO  SETUP"
10005: HOME
10010: POKE 34,24
10020: DIM A(40,24),X(20),Y(20)
10030: FOR I= 1TO 40
10035: : HTAB I
10040: : VTAB 1
10050: : PRINT "X";
10060: : VTAB 24
10070: : PRINT "X";
10072: : A(I,1)= 1
10074: : A(I,24)= 1
10080: ::NEXT
10090: FOR I= 1TO 24
10095: : VTAB I
10100: : HTAB 1
10110: : PRINT "X";
10120: : HTAB 40
10130: : PRINT "X"
10132: : A(1,I)= 1
10134: : A(40,I)= 1
10140: ::NEXT
10190: Z= INT (RND (10)* 15)+ 5
10195: Z1= Z
10200: FOR I= 1TO Z
10210: : "DO  PLACE"
10220: : X(I)= X
10230: : Y(I)= Y
10240: : HTAB X(I)
10250: : VTAB Y(I)
10260: : PRINT "&";
10265: : A(X,Y)= 2
10270: ::NEXT
10300: FOR I= 1TO INT (RND (1)* 15)+ 10
10310: : "DO  PLACE"
10320: : A(X,Y)= 1
10330: : HTAB X
10340: : VTAB Y
10350: : PRINT "O";
10360: ::NEXT
10400: "DO  FIRST SET"
10500: JU= INT (RND (4)+ 2)
20000::FIN

20100"TO  PLACE"
20110: X= INT (RND (1)* 40)+ 1
20120: Y= INT (RND (1)* 24)+ 1
20130: IF A(X,Y)( ) 0THEN 20110
20140::FIN

25000"TO  DELAY"
25010: FOR I= 1TO 2500
25020: ::NEXT
25030::FIN

27000"TO  WIPE"
27010: A(X,Y)= 0
27020: HTAB X
27030: VTAB Y
27040: PRINT " ";
27050::FIN

28000"TO  FIRST SET"
28010: "DO  PLACE"
28020: FLASH
28030: HTAB X
28040: VTAB Y
28050: PRINT "*";
28060: "DO  DELAY"
28070: NORMAL
28080: A(X,Y)= 3
28090::FIN

29000"TO  DRAW ZOMBIE"
29010: HTAB XA
29020: VTAB YA
29030: PRINT "&";
29040: A(XA,YA)= 2
29050::FIN

+&C
PGM SAVED (Y/N)?Y
CONVERTING...
100  "TO  END"
200  "TO  LINES"
300  "TO  GAME"
400  "TO  MOVE"
1000 "TO  ZOMBIE"
5000 "TO  MOVE ONE"
10000"TO  SETUP"
20100"TO  PLACE"
25000"TO  DELAY"
27000"TO  WIPE"
28000"TO  FIRST SET"
29000"TO  DRAW ZOMBIE"

+LIST
10  HOME
11 E = 1
15  IF  NOT (E = 1) GOTO 60
17  CLEAR
20  GOSUB 10000:::::::::
25  GOSUB 25000:::::::::
30  GOSUB 300:::::::::
40  GOSUB 100:::::::::
50  GOTO 15:::
60  END
100  REM :::::::
110  GOSUB 200:::::::::
111  IF  NOT (Z = 0) GOTO 114
112  PRINT "CONGRATULATIONS, YOU
     WON !!"
113 ::: GOTO 116
114  REM :::
115  PRINT "BAD LUCK - YOU'RE DEA
     D !!"
116  REM ::
119  PRINT
120  PRINT "DO YOU WANT ANOTHER G
     AME (Y/N)..?"1
130  GET A$
140  IF A$ = "Y" THEN 170
150  IF A$ ( ) "N" THEN 130
160 E = 0
165  RETURN
170 E = 1
180  RETURN ::
200  REM :::::::::
205  POKE 34,0
206  HOME
210  PRINT
220  PRINT
230  PRINT
240  RETURN ::
300  REM ::::::::
310  IF  NOT (Z ( ) 0) GOTO 350
320  GOSUB 400:::::::::
330  GOSUB 1000:::::::::
340  GOTO 310:::
350  RETURN ::
400  REM ::::::::
410  IF  NOT ( PEEK ( - 16384) )
     127) GOTO 530
412 X1 = 0
414 Y1 = 0
420  GET A$
430  IF A$ = "W" THEN Y1 =  - 1
440  IF A$ = "A" THEN X1 =  - 1
450  IF A$ = "S" THEN X1 = 1
460  IF A$ = "Z" THEN Y1 = 1
470  IF  NOT (A$ = "D" AND JU (  )
     0) GOTO 520
475 JU = JU - 1
480  GOSUB 27000::::::::
490  GOSUB 28000:::::::::::::
510  RETURN
520  REM ::
530  REM ::
600  GOSUB 27000::::::::
630 X = X + X1
640 Y = Y + Y1
650  IF A(X,Y) (  ) 0 THEN 40
660  HTAB X
670  VTAB Y
680 A(X,Y) = 3
690  PRINT "*";
700  RETURN ::
1000  REM :::::::::
1010  FOR I = 1 TO Z1
1015  IF  NOT (X(I) (  ) 0) GOTO
     1065
1020 XA = X(I)
1030 YA = Y(I)
1040  GOSUB 5000::::::::::::
1050 X(I) = XA
1060 Y(I) = YA
1065  REM ::
1070  NEXT
1080  RETURN ::
5000  REM ::::::::::
5010 A1 =  SGN (X - XA)
5020 B1 =  SGN (Y - YA)
5030  HTAB XA
5040  VTAB YA
5050 A(XA,YA) = 0
5060  PRINT " ";
5070 XA = XA + A1
5080 YA = YA + B1
5090  IF  NOT (A(XA,YA) = 0) GOTO
     5150
5100  GOSUB 29000::::::::::::::

5140  RETURN
5150  REM ::
6000  IF  NOT (A(XA,YA) = 2) GOTO
     6050
6010 XA = XA - A1
6020 YA = YA - B1
6030  GOSUB 29000::::::::::::::::

6040  RETURN
6050  REM ::
7000  IF A(XA,YA) = 3 THEN 40
7010 Z = Z - 1
7020 XA = 0
8000  RETURN ::
10000  REM :::::::::
10005  HOME
10010  POKE 34,24
10020  DIM A(40,24),X(20),Y(20)
10030  FOR I = 1 TO 40
10035  HTAB 1
10040  VTAB 1
10050  PRINT "X";
10060  VTAB 24
10070  PRINT "X";
10072 A(I,1) = 1
10074 A(I,24) = 1
10080  NEXT
10090  FOR I = 1 TO 24
10095  VTAB I
10100  HTAB 1
10110  PRINT "X";
10120  HTAB 40
10130  PRINT "X"
10132 A(I,I) = 1
10134 A(40,I) = 1
10140  NEXT
10190 Z =  INT ( RND (10) * 15) +
     5
10195 Z1 = Z
10200  FOR I = 1 TO Z
10210  GOSUB 20100:::::::::
10220 X(I) = X
10230 Y(I) = Y
10240  HTAB X(I)
10250  VTAB Y(I)
10260  PRINT "&";
10265 A(X,Y) = 2
10270  NEXT
10300  FOR I = 1 TO  INT ( RND (1
     ) * 15) + 10
10310  GOSUB 20100:::::::::
10320 A(X,Y) = 1
10330  HTAB X
10340  VTAB Y
10350  PRINT "O";
10360  NEXT
10400  GOSUB 28000:::::::::::::
10500 JU =  INT ( RND (4) + 2)
20000  RETURN ::
20100  REM ::::::::
20110 X =  INT ( RND (1) * 40) +
     1
20120 Y =  INT ( RND (1) * 24) +
     1
20130  IF A(X,Y) (  ) 0 THEN 2011
     0
20140  RETURN ::
25000  REM :::::::::
25010  FOR I = 1 TO 2500
25020  NEXT
25030  RETURN ::
27000  REM :::::::::
27010 A(X,Y) = 0
27020  HTAB X
27030  VTAB Y
27040  PRINT " ";
27050  RETURN ::
28000  REM ::::::::::::::
28010  GOSUB 20100:::::::::
28020  FLASH
28030  HTAB X
28040  VTAB Y
28050  PRINT "*";
28060  GOSUB 25000:::::::::
28070  NORMAL
28080 A(X,Y) = 3
28090  RETURN ::
29000  REM ::::::::::::::::
29010  HTAB XA
29020  VTAB YA
29030  PRINT "&";
29040 A(XA,YA) = 2
29050  RETURN ::
```

● Circle No. 159 ▶

precision in miniature
New Series MT100 matrix printers

Only the size and price are small. Performance is big, like the list of standard features. The MT100 Series miniature matrix printer has traditional Mannesmann-Tally reliability built in from the start. It's light, quiet and easy to use – the perfect partner for small systems, interfaceable with most computers.

The MT120 gives a degree of sophistication not normally associated with mini printers. Standard features offered include:

9x7 matrix, 160 cps high speed output – often doubled by micro-processor control which chooses shortest print path in either direction; selectable 18x40 matrix for high definition correspondence quality; 10 different character sets, each with 96 characters; OCR A and B character fonts using 9x9 matrix; 80 to 132 cpl, 10 to 16.6 cpi; friction paper feed – ideal for correspondence – is standard with optional tractor feed available.

The MT110 is also available in the range offering 100 cps print speed and 7x7 character matrix.

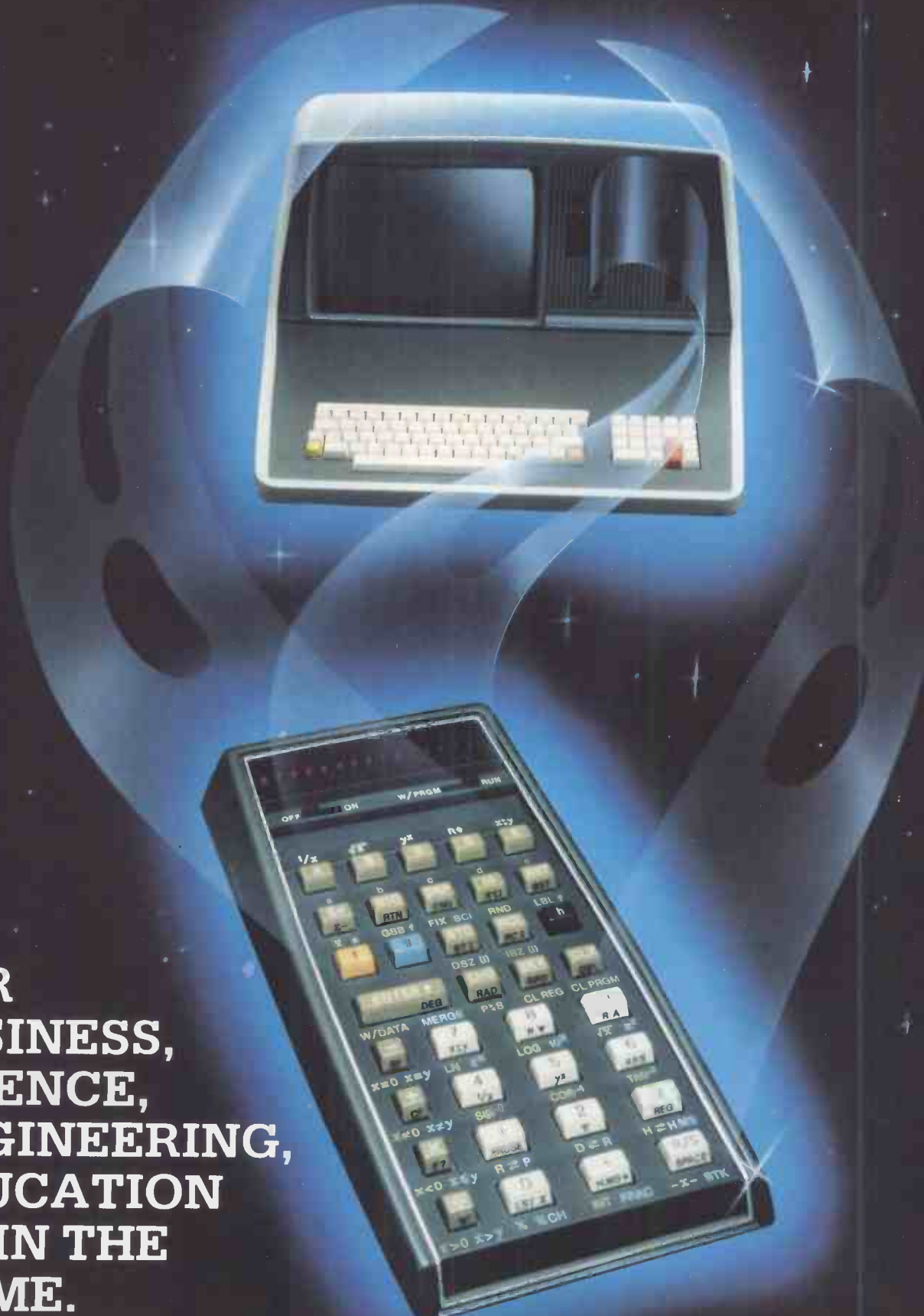
Printers for the long run

MANNESMANN TALLY

There's more. Contact
Mannesmann-Tally Limited,
7 Cremyll Road,
Reading, Berkshire.
Tel: Reading (0734) 580141.
Cables: Tally-Reading.
Telex: 847028

MatheMagic®

TRANSFORMS YOUR MICROCOMPUTER INT
THE ULTIMATE CALCULATOR



FOR BUSINESS, SCIENCE, ENGINEERING, EDUCATION OR IN THE HOME.

B2

THERE IS NOTHING ELSE LIKE IT ON THE MARKET!

Now, use your computer for sophisticated mathematical calculations without any programming. International Software Marketing introduces a unique software product – MatheMagic®.

Whether your applications are as complex as structural engineering or as simple as balancing household accounts, MatheMagic® is flexible and easy to use.

MatheMagic® is the answer to numbers processing for business, education, engineering, science and home management.

The Ultimate Calculator is available for Apple II or II+; available soon for Atari, TRS-80 I, II & III, Z-80 based micros with CP/M 2.2, Commodore Pet, CB/M and IBM PC.

CP/M is the registered trademark of Digital Research, Inc. Z-80 is a registered trademark of Zilog Corp.

FEATURES:

- Menu-driven format for rapid learning and ease of use.
- On line "HELP" for every MatheMagic command and option.
- Free-form entry of expressions of up to 240 characters (including standard maths operators, pre-defined functions, user-defined formulas, parentheses, variables, etc.).
- Virtually unlimited use of all formulas within formulas.
- Built-in mathematical functions (trig, logs, conversions, etc.).
- Easy to create and edit variable sets and values.
- Disk storage and recall of user-defined formulas and variable sets.
- Automatic retention of variable values for chain calculation.
- Free use of "ask variables" to allow "what if" and repeat types of calculations.
- Full hard copy support, including a trace function.
- A configuration segment to take advantage of your system facilities.
- User numbers assigned, so multiple user files may reside on disk.
- Number base conversions (e.g. Hex/Decimal) provided.
- Rapid calculation or stepped calculation for viewing intermediate results.
- Automatic repeat calculation.
- Comprehensive user reference manual with sample applications.

ism

International Software Marketing
Hayden House, 5-6 Millmead,
Guildford, Surrey, GU2 5BE.
Telephone: Guildford (0483) 503603.

● Circle No. 160

Sales Ledger answers the stock questions

Taking advantage of the greater screen and memory capacity of the 8050 Pet, Sales Ledger from Anagram contains a complete stock-control system in one comprehensive suite. Peter Wood evaluates its features.

REVIEWING the Anagram Stock System back in September 1980, we said that "The system is a superb piece of programming on a par with VisiCalc". Anagram Systems has come a long way since then, having converted its pakages from the 40-column Pet to the new 80-column machines, including some extra features at the same time. The few criticisms we made have been noted and acted upon, and now the system is available integrated with the Sales Ledger and Invoice Printing on 8050 disc format.

The 8050 gives far greater capacity than the original 2040, 3040 or 4040 units and thereby provides the software authors with a much bigger market-place for stock and ledger systems. Since Commodore announced the Mator Shark hard-disc unit, and the Corvus hard disc became available for Pet, the capacity problems normally associated with stock systems on micros have virtually evaporated — with up to 40,000 stock lines on one Mator, for instance. The larger directory capability of the 8050 unit has allowed Anagram to integrate its Sales Ledger program with the Stock System, and produce a very comprehensive and detailed program suite, with sufficient capacity to interest many businesses. In addition, Anagram has produced a manufacturer's version of the Stock System, with assemblies, costings and shortfalls; a Purchase Ledger with nominals and a Sales Ledger with nominals. All the Anagram packages have been adopted by Commodore and constitute the core of Commodore's business software range.

High-quality manuals

The standard of software documentation improves almost daily now, with more suppliers realising that good manuals mean good sales, and repeat business. Commodore has recently employed a full-time technical writer: her influence can be seen in the revamped Anagram manuals, which are easy to read, well-indexed and accurate.

All the Anagram programs are written entirely in 6502 machine code, which makes them very fast and extremely efficient, a fact that is especially noticeable when swapping between screen displays. The screen information is updated so quickly that it is virtually impossible to see the change take place.

Movement between the various screens is effected by pressing so-called Program Function Keys, a term borrowed from IBM, whose keyboards include keys marked PF1, PF2 and so on. On the Pet, the PF keys are emulated by pressing shift and a number key, so that PF0 is a shifted zero for instance. This may seem unnecessarily complex, but when there can be over 100 different screens in a program, it is a sensible way of allowing the user to move around the system quickly, without going through innumerable menus.

Stock item	Description	In stock
C-E	CBM to IEEE Cable	19
CBM4022	80 col.dot matrix printer	4
CBM8024	132 col. printer	2
CBM8032	CBM 8032 32K Micro.	8
CBM8050	CBM 1Meg. Disc Drive	15
E-E	IEEE to IEEE Cable	7
PUR	Purchase Ledger Package	0
SAL	Sales Ledger Package	0
SCS	Stock Control Package	0

Each screen display has an associated "help" screen, which may be displayed by pressing PF0. It allows inexperienced operators to find their way around quickly and without continually referring to the manual, while leaving the main screens uncluttered by spurious information. Once the concept of PF keys has been grasped — which take the average user about five minutes — the system is remarkably easy to use and very friendly. A file-create program has to be run when the system is first installed, in order to define the number of diskettes to be used or, in the case of the hard disc, the number of blocks to be allocated for the file. Once the file creation has been run, the user may begin entering data into the system.

The program is loaded, as are the majority of Pet programs, by pressing Shift and Run, with the program disc in drive and the data disc in drive 1. The system displays a copyright notice for a few seconds, while the main program is loaded, and then requests the date. If the system is being run for the first time ever, the period start date — first of the month — must also be entered.

Once the system has been told the year, you will never have to enter it again, as a full Gregorian calendar checks all date entries for validity. Pressing PF3 takes you to the Master Menu, which has five options:

- Sales Ledger menu,
- Stock Control menu,
- Produce an Invoice,
- General processing,
- File maintenance.

The screen invites you to "select the option required with the cursor and press shifted Return". Moving the cursor from line to line on the menu can be accomplished by pressing any unshifted key except Stop, which allows you to close down the system if required.

The first option to select when setting up the system initially is general processing. Through it you may enter the current VAT rates — four are permitted, with VAT Exempt as the fifth — the printing defaults and your firm's details. The printing defaults include standard messages for the various reports, such as terms of sale, settlement discount and settlement days; the next automatic invoice number, if automatic numbering is required; the number of invoice copies to be printed; whether letterhead stationery is to be used, in which case the firm's details are not printed by the system; and type of printer and size of paper.

The firm's details are name; four lines of address, including post code; telephone number; and VAT registration number. This flexibility means that you

may opt to use plain paper, letterhead or pre-printed stationery designed for use with the system. Once this information has been entered, it is used as the default for all future printing, but it may be amended at any time.

Selecting the sales-ledger option produces another menu of five options:

- Ledger Processing,
- Customer Processing,
- Suspense Account,
- Sales Area Processing,
- Report Printing.

Customer Processing allows examination, addition, alteration or deletion of customer details.

Unlike most other systems, this program stores and retrieves accounts by customer name rather than account code, which eliminates the problem of remembering account numbers and makes the process far simpler. Once stored, the account may, if required, be accessed by only the first few letters of the name, making for much faster operation. If the partial name is unique, then the account is displayed immediately; if more than one account matches the input, then all the possibilities are shown and the operator may select the correct one with the cursor.

der	Allocated	Price
0	0	25.00
0	0	425.00
10	0	1200.00
25	0	895.00
10	1	895.00
0	0	25.00
0	0	399.00
0	1	299.00
0	1	400.00

Fail-safe feature

Another aspect of the program which makes for faster and easier operation is the way the system ignores upper and lower case when looking up a record, while retaining the correct case when printing. For instance the account "Practical Computing" would be printed exactly as entered, but may be looked up by simply typing "prac", for example. You cannot delete an account unless the balance is zero — a valuable safety feature which prevents costly mistakes.

If the operator is unsure of the name of an account, then an index of all the accounts may be displayed, and the correct one selected with the cursor. Accounts are automatically placed in alphabetical order as they are entered, which avoids time-consuming sorting and ensures that individual accounts are easy to find, even in a long list.

The ledger-processing option requests the account name, which is entered again as either the full name or a partial name. A menu of options is then displayed, along with the account name and the current balance. The program caters for the addition, alteration or cancellation of invoices, credit notes and payments as well as "unallocatd credit", where a single credit note is to be issued against a number of unspecified invoices. This credit may then be allocated to the appropriate invoices at a later date.

The system is entirely "open item", which means that any unpaid invoices are held on file indefinitely. Partial payments of invoices and partial credits are also catered for. The account detail may be examined on the screen at any time, with all outstanding invoices, credits and payments appearing in date order. There is not enough space on a floppy diskette to store the full details of every invoice, so only the goods total, carriage, VAT and discounts are retained. The user is expected to keep a copy of the physical invoice.

The suspense account is provided for those awkward occasions when a cheque is received without remittance advice, and the account for which it is intended cannot be identified immediately. Posting the amount of the cheque, together with an appropriate note, into the suspense account, records the arrival of the payment in the system. As soon as the customer has been identified, the posting can be transferred from suspense to the correct account. There is a facility to clear down all the items in suspense, but a printout of all the postings occurs before this can take place.

The Sales Area Processing option provides for the examination, addition, alteration or deletion of sales areas, which may be used for the analysis of sales by area, salesman and so on. These areas are identified by a code of up to three characters, and carry a fuller description for reporting. For example, you may set up "SY" as a sales area, with "Surrey" as the description, for use as a report heading. Each customer can be assigned to a sales area, so that the analysis takes place automatically.

Selecting Report Printing produces one of the largest menus in the system, with eight different reports provided, each of which has further selection criteria that may be applied. The reports are:

Sales List — equivalent to a sales day book. You may produce the report for month-to-date or as a daily list for a particular day; for all sales areas or for a specified area; and for all customers or a group of customers selected alphabetically.

Cash List — equivalent to cash received. Selections as for the sales list option.

Credit Note List — equivalent to the other side of the sales day book. Selections as for the sales-list option.

Current Balances shows the up-to-date account balances, and may be produced for all customers or only those with non-zero balances, for all sales areas or a specified area, and for all customers on file or a group.

Aged Debt Analysis — the traditional aged debtors' list, but shown for four months and over, three to four months, two to three months, one to two months and under 30 days. May be produced by area and by group if required.

Customer Statements may be selected for the following categories: only customers with an outstanding balance; customers with an outstanding balance and all accounts settled this month; customers with an outstanding balance which includes an invoice dated earlier than a date you specify; the same customers but including all accounts settled this month. You may specify also a sales area and a group of accounts for selection.

Suspense Account prints details of all suspense postings in date order.

Customer Names and Addresses prints this information by sales area and by group. It may be printed with full detail on to plain paper, or as address labels on gummed label stationery.

The stock control menu consists of nine different options:

- Stock Enquiry,
- Stock Item Processing,
- Order Processing,
- Allocation Processing,
- Movement Processing,
- Stocktaking,
- Price Changes,
- Supplier Processing,
- Report Printing.

Stock Enquiry allows you to examine a "stock card", either by entry of the stock-item reference or via an index of references, similar in operation to the sales ledger. A stock-item reference may be up to 10 characters in length, and may be any mixture of letters or numbers. As with the sales ledger, upper case may be used for legibility when adding a new stock item, but lower case is sufficient for recall of the information.

The first page of the stock card shows the stock-item reference and its description; a free-stock figure, which is physical stock plus quantity on order less quantity allocated; in-stock, on-order and allocated figures; the date of the last activity on this item; its bin number or location; "supersedes" and "superseded-by" information; the quantity description, e.g., dozen, kgs, gross; reorder level, reorder quantity, minimum stock level, maximum stock level, lead time, cost price, selling price and VAT rate.

Pressing PF2 displays the name and address of the main supplier of the item, followed by as many pages as are required to show the sub-suppliers, with separate lead times and cost prices. The main cost price may be used as an average cost price, automatically calculated from the quantity received from each supplier at either the price specified in the supplier record, or a price entered manually when the goods are received.

Pressing PF4 displays details of all outstanding orders for the item, with date of order, order reference, quantity ordered, date due, supplier code, quantity received

(continued on next page)

(continued from previous page)

to date, lead time and total order value. Each receipt or partial receipt of order may also be displayed. The original stock card may be redisplayed by pressing PF8.

PF5 will show all the in and out movements for the month for the item, and PF6 will show all outstanding allocations. Allocation details displayed are: date required, allocation reference, quantity required, cost centre, quantity sent and total allocation. PF7 causes the entire stock card to be printed out.

The facility to flit about throughout the system provided by the PF keys makes the program very quick and easy to use, especially where a large amount of data is being held.

Stock-control options

Stock Item Processing is used to examine, add, alter or delete stock cards. The user is prevented from deleting any item that remains active.

Order Processing is split into two main sections; single item or bulk order. In both cases the options are to raise, alter or cancel an order, but the bulk-order facility allows easy batch-entry of information, plus optional printing of the order to be sent to the supplier, complete with the supplier's name and address. When raising a bulk order, the operator has only to enter the stock-item reference for the program to display the description and standard cost price automatically.

Once the date due has been entered for the first item on the order, the system will default to that date for every following item, although the user may overtype both the date and cost price if necessary. The total cost of each line of the invoice is calculated and displayed at each stage, apparently instantaneously, providing yet another visual check.

Allocation Processing acts as the complement of order processing, and provides for single or bulk allocations.

Movement Processing is used for receipt of orders, issues of allocations, and miscellaneous in and out movements. There is an option to process either a single item or a bulk order or allocation. In-movements may be used to update the standard cost price if required, and automatic averaging may be used. Stock may be issued at standard selling price or at a manually-entered figure. Each out-movement may be analysed to a cost centre if required.

The Stocktaking option is used for manual adjustment of stock figures after completing a stocktake, and generates an appropriate in- or out-movement with a reference of "stocktake" on the stock record.

The Price Changes option is used to either increase or decrease the cost and/or retail prices by a percentage specified by the operator. The changes may be selectively applied to only those items relating to a specific supplier, and further to only a range of items selected by item reference.

Supplier Processing simply provides the ability to examine, add, alter or delete a supplier record. A supplier record consists of a code of up to three characters, name, four lines of address, telephone number and contact name.

The stock-control Report Printing menu is thoroughly comprehensive, with 11 different reports, each of which may be selectively produced for a range of items, as well as by other criteria:

Stock Cards — full page per item, showing the semi-permanent information about the item, together with suppliers, order history, in- or out-movements and allocation history. It may be selected for only those items which have had activity in the current month.

Stock Level Highlights shows all items that are under reorder level and/or minimum-stock level or over maximum-stock level.

Stocktaking List shows item reference, description, bin location, quantity description and quantity in stock, used to physically check stock items.

Outstanding Orders shows items on order and total value of orders, either for all suppliers or for a specific supplier.

Outstanding Allocations operates as for outstanding orders, but not by supplier.

Stock Valuation gives total cost and retail value for each stock line, plus a total stock value.

Stock Movement Analysis gives total cost of all in-movements and total selling value of all out-movements for each item, and computes the difference as a gross profit figure item by item.

Cost Centre Analysis shows all movements for a specific cost centre.

Inactive Stock prints all items that have had no activity since a specific date entered by the user.

Price List simply prints a price list.

List of Suppliers prints full details of all suppliers on plain paper.

The heart of the integration of this system is the produce-an-invoice option on the master menu. This section first requests a customer account name, or partial name, exactly as in the sales ledger section. Once the account has been found, the name and the account balance is displayed together with the following information: invoice number, which is normally generated automatically; the invoice date and tax point; which both default to the current date; the settlement discount and days; terms of payment; and the customer's address. The operator may overtype any of the default information.

The user then enters the following: order reference; the amounts charged for carriage and VAT on carriage; a trade-discount percentage figure, if required; the delivery note number; and up to three lines of notes to appear on the invoice. Once this detail is complete, PF2 is pressed to go on to entering the invoice lines.

Up to 20 lines may be printed in each page of the invoice, and as many pages as necessary may be produced. Each line requires only the entry of the stock-item reference to cause the display of the description, quantity description, default unit price and VAT rate for that item. The quantity is then entered, together with a line discount, if required, and the price if an alteration is necessary. The line total is automatically calculated and displayed.

Once the invoice page is complete, the system will print the invoice, post the totals to the appropriate ledger, and adjust the stock levels as necessary. It will also suggest that you check the stock level of any items which are under the preset levels.

The final option from the main menu is the file maintenance section which consists of a four-option menu:

- File Usage displays the amount of the space used, and the amount remaining at any time.
- Start of Month Processing is used to clear off all completed invoices, orders and allocations, to make room for the next month. This section also sets the system date to the first of the next month.
- Condense Customers is used to clear off completed invoices for a specific customer or range of customers when disc space is at a premium.
- Condense Stock Items does for the stock items what the previous option does for customers.

During a fairly long and detailed evaluation, we were unable to crash this program in any way, by entering the wrong data, or selling items that we did not have, or turning the printer off, or any of the other "standard" ways of breaking a piece of software. It is a credit to the authors that they have managed to write a program that is both secure and convenient to use.

The Anagram Sales Ledger with Stock Control is available from most Commodore dealers or direct from Anagram Systems, 60A Queen Street, Horsham, West Sussex. Telephone, (0403) 50854.

Conclusions

- **The Anagram Sales Ledger and Stock Control System is a very comprehensive and detailed program, which should provide most medium-sized companies with all they need for stock and ledger work.**
- **The standard of software is very high: it is easy to use and apparently unbreakable.**
- **The speed of operation is satisfactory, since machine code has been used.**
- **The accounting facilities seem more than adequate for most companies.**
- **The stock facilities are comprehensive and those we tested are generally suited to a marketing company. We understand a version exists for manufacturers.**
- **The use of PF keys may be slightly confusing at first, but they greatly speed up the operation of the system, and provide far greater flexibility than other methods we have seen.**
- **The package is well documented, and the help screens within the progam provide an excellent back-up to the manual.**
- **At £799 the program represents good value for money.**

The Printer People

IF YOU NEED A PRINTER TOMORROW, CALL US TODAY.

PRINTERS

NEC SPINWRITER | OKI MICROLINE | ANACOM | TALLY | TEXAS
TEC STARWRITER | QUME SPRINT 9 | QANTEX | RICOH | EPSON

SCREENS

HAZELTINE | TVI
DEC VT 100 | BMC

ADD-ONS

PRINTER BUFFERS (16k)
SINGLE SHEET FEEDERS

EPSON

MX80 RANGE

The unbelievable quality printer from the world's largest print head manufacturer. A whole stable of machines to suit a wide variety of applications: MX80 , MX82, MX 80FT/1 & MX80 FT/New Type 2. MX100

MICRO-CUE

PRINTER BUFFER

16K

Multi-port printer buffer means one to four printers can be interfaced with one to four computers in any combination to allow all machines to be in operation at same time

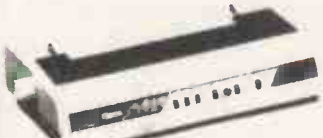
BDT

ASF 160/560

BDT automatic sheet feeders automate the only thing left in word processing that needs automation. No word processing system is truly automatic if an operator is required to hand feed sheets into the printer, or resort to perforated continuous stock. This handling individual sheets can now be a thing of the past.

QUME

SPRINT 9



The Daisywheel Printing Terminal series that sets a new standard for print quality, reliability and serviceability. Unbeatable performance at a realistic price.

NEC

3500

35 CPS Impeccable print quality printers utilising the NEC print "thimble". KSR and RO versions available all with a whole host of impressive features you have come to expect from NEC.

TEC

STARWRITER

Daisy wheel printer for word processing, professional results. Diablo compatible, suitable for most micro and mini computers.

TVI

910/920/925/950

Green Screen
Fully intelligent terminals with 24x80 display & dual intensity, blinking, reversed, underlining and protect fields, 96 ASCII chrs etc.

HAZELTINE

ESPRIT

Green Screen

The Hazeltine Esprit is a buffered terminal capable of displaying the complete 128 ASCII character set. Based on a 12" diagonal non-glare CRT, the video is crisp and clear with each character presented on a large matrix to reduce eye fatigue.

NORTHAMBER LIMITED

3 & 4 DAWES COURT,
ESHER, SURREY.
Tel: Esher (0372) 62071 or 66398 (from 01 nos. dial 78-62071 or 78-66398)

Importers, Distributors & Wholesalers of quality Computer products.

0372 62071

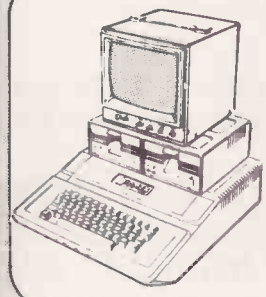
If you want a Printer tomorrow- call us today

87

● Circle No. 161

ATLANTIC COMPUTER STORE

UY . . . RENT . . . LEASE . . . BUY . . . REN
EASE . . . BUY . . . RENT . . . LEASE .



APPLE II

48K Apples	£650.00
Double Disk Drives with Controller Card	£550.00
Monitors from	£ 99.00
Z80 Soft Card	£195.00
Serial/Parallel Cards	£ 65.00
Visicalc 3.3	£100.00

Full Range of software — too numerous to mention!

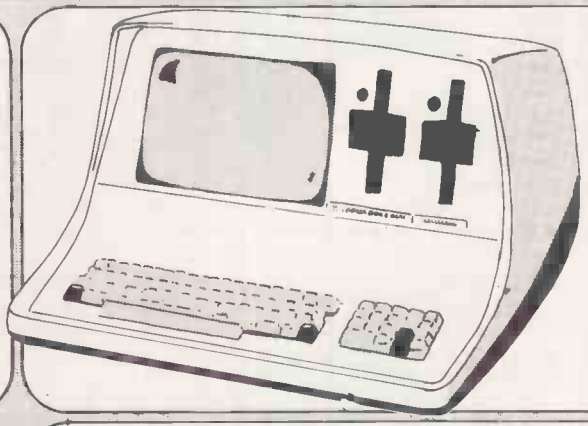
COMMODORE

Commodore 8032 CBM	£755.00
Commodore 4032 PET	£595.00
Commodore Printer 4022	£395.00
Commodore 8050	£795.00
Bags of Software	
Special Offer:–	
D.M.S.	£200.00
Visicalc	£100.00

PRINTERS

Microline 80	£295
Epson MX80	£350.00
Anadex DP 9500	£875.00
Centronics	£299.00

SPECIAL OFFER
RICOH
£1295.00 · 60 c.p.s.



SUPERBRAIN From £1750

Integrated Accounting System — Stock Control @ £350. Order Entry and Invoicing @ £350. Sales Ledger @ £350. Purchase Ledger @ £350. General/Nominal @ £400. Name & Address @ £250. Complete Package so far @ £1650 plus Payroll @ £500.

SPECIAL OFFER

Letter quality word processing system. **£2,995**
includes 1 day's training.

Buy a typewriter which you can use with your computer

Silver Reed/Olivetti RS232 – Centronics – IEEE interfaces now available

SPECIAL OFFER
Olympia Scripta K.S.R.
£850.00 + VAT

TELEVIDEO NETWORK HAS ARRIVED!

System II: supports up to six users. Single board design. Z80A. 64K of Ram memory. 4K EPROM. 10 Mbytes 5¼" Winchester disk drive. 1.0Mbyte mini-floppy disk back-up unit. Parallel port and two serial ports for printer attachment and servicing. With one TS80 £5,130.00
Each additional 64K terminal £1026.00

A MUST FOR MULTI USERS
will run your existing cp/m software.

Eagle II

The Business System
64K – Dual Floppies (768K)
Anti-glare screen.
The hardware comes complete with 8 software packages. A fully integrated business system incorporating order processing, ledger accounting and stock control. Plus full word-processing capabilities.

Special Price £3,650.00 complete

ATLANTIC SERVICE FACILITIES

The company provides *full* servicing cover throughout the entire country on a 24 hour call-out basis. Additionally, the company has its own hardware engineering team based at the main office in London.

ATLANTIC CONSULTANCY

The Company also retains the services of highly experienced computer consultants who are readily available to design a system to meet your special business requirements.

ATLANTIC TRAINING SERVICES

Atlantic Micro Systems provide a modern, 3,000 sq. ft. professional training centre capable of training up to 250 people a week using the latest teaching aids.

DEALER ENQUIRIES WELCOMED

SOFTWARE

dBase II	£375
Basic	£175
Cobol	£350
*Micromodeller	£585
Supercalc	£185
D.M.S.	from £200
Spellbinder	£250
*Wordstar	£250
Mailmerge	£ 75
Supersort	£120
Redword	£340

*Available on Apple

STOP PRESS

XEROX 320

64K plus 320KB Dual disk drives. Full range of cpm software available.

£1695 RRP £1,845

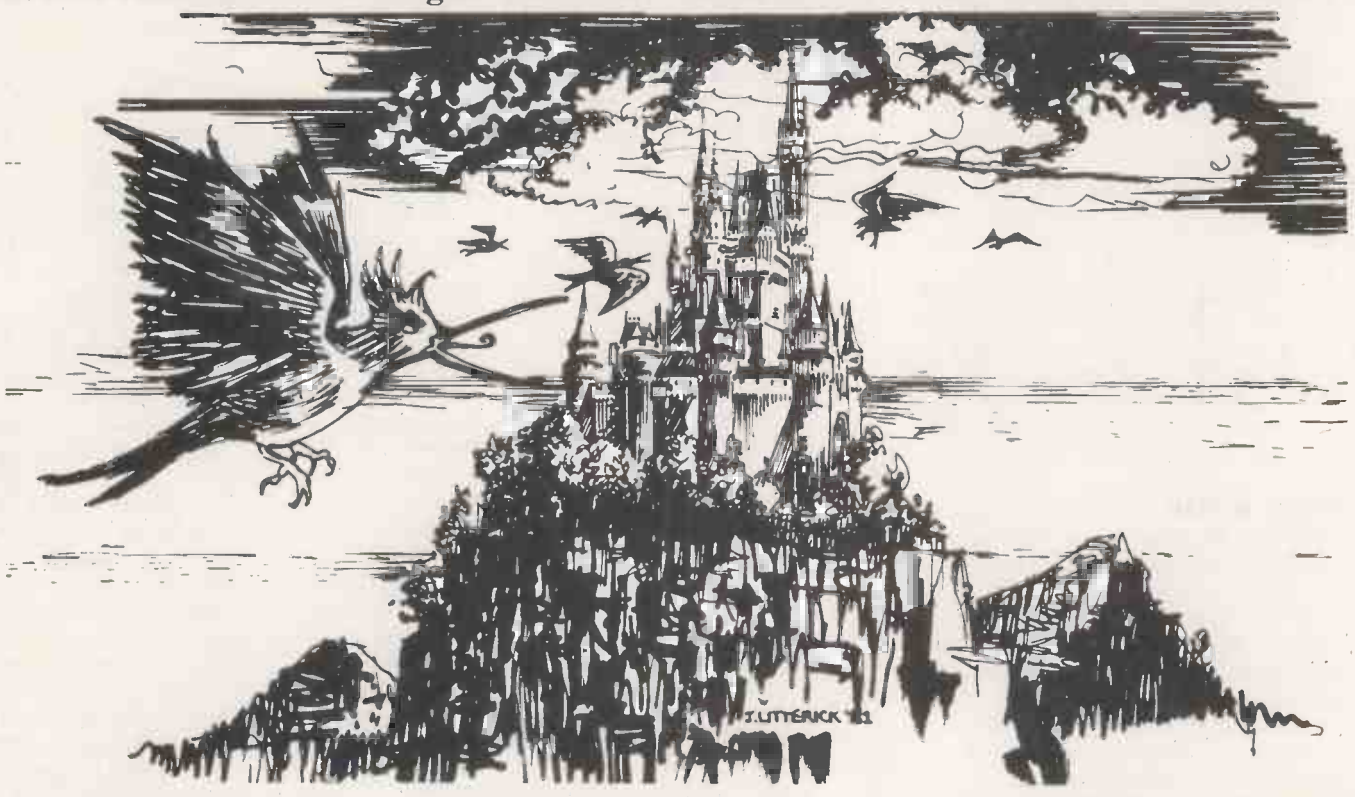
ATLANTIC
ATLANTIC MICRO SYSTEMS

70-72 Honor Oak Park, London SE23 1DY.
Telex: 896691 1RG ATLANTIC
Overnight deliveries. Telephone orders welcome on all credit cards. All prices are exclusive of VAT and delivery. ATLANTIC prices subject to dollar fluctuation.

Tel: 01-699 2202

● Circle No. 162

Adventure, the classic microcomputing game, has spawned hordes of look-alike programs and seems destined to dominate the game-playing scene for some time. Dennis Ellis reviews its origins and looks ahead to the exotic versions of the future.



Kings of the castle walls

OF THE COUNTLESS computer games to have arisen in the last few years, the one called Adventure towers head and shoulders above all the rest. It is equalled in its popularity only be the immensely successful Space Invaders games. Adventure was written by Crowther and Woods of Stanford Research Institute, based on the game of Dungeons and Dragons by Gygax and Arneson.

Dungeon master

Dungeons and Dragons was the first role-playing game in which players assume alter-egos and use them to wander through strange, exotic lands or caves, encounter hideous monsters and strive to accumulate wealth while building up the personality of their particular character. Their origins can be traced back even further to the appeal of the sword-and-sorcery novels, by such authors as Michael Moorcock, that gained such popularity in the early 1970s.

These games usually have a dungeon master who does not actually participate. He or she has a detailed map of the dungeon, and charts the progress of the players and other unsavoury inhabitants of the dungeon. At the start the players do not know the layout of the dungeon. They tell the dungeon master which passage they want to enter next, and the dungeon master describes their new location plus any objects around. If a confrontation with a creature takes place, the dungeon master throws dice to simulate the random element in any conflict, and after weighing up such factors as what weapons are being carried, how strong the contestants are — based on earlier skirmishes and blows suffered — the result is announced. As you can see, there are few limitations to the game, and some games have lasted for many weeks.

Will Crowther's computer program for Adventure was written in Fortran and undertook the role of the dungeon master for the players. You typed in your request and the program described your new location and its contents. Adventure was released to an unsuspecting world in 1976. It was added to the Decus library — the free software-exchange mechanism for the Digital Equipment Computer Users' Society — and installed mostly on Dec's PDP-11 systems. Within a short time its popularity was outstripping every other program on this library, which contained several thousand very worthy works.

In 1978, Dungeon was added to the Decus library. It amplified the concept even further, with more locations, descriptions, inhabitants and intriguing puzzles to solve. Dungeon was written by four members of the Programming Technology Division of the MIT Laboratory for Computer Science, Tim Anderson, Marc Blank, Bruce Daniels and Dave Lebling. Again, it proved a winner.

With so little information available about such popular public property, it is not surprising that modern myths are emerging around these programs. One of them relates how players telephoned the authors at 3 a.m. to ask how to get back across the Troll's bridge.

It has been said that Dungeon was written in only four days — from Friday evening working solidly through to Monday morning, though it must take longer just to type in the text. So much interest was generated by Adventure that the wary Dungeon authors embedded a strong warning in the program to the effect that any personal callers would be rudely ejected from their premises.

Adventure and Dungeon both needed extensive disc back-up to store the database containing the descriptive text and the links between interconnecting passageways. Though this clearly made it unsuitable for the normal home computer, the floodgates opened and all man-

(continued on next page)

(continued from previous page)

ner of Adventure games poured on to the micro market. Even a watered-down version of Dungeon, called Zork, is now available to home users.

Most Adventures cannot have people walking about willy-nilly so they usually restrict themselves to some constraining environment such as caves, dungeons, pyramids, mansion houses or even a spaceship. There are now a large number of Adventure games using every computer trick and gimmick available and the list is growing every day.

Classification of these games is a difficult task as there are hundreds of databases and almost as many ways of implementing them. Some games use high-resolution graphics, while others have real-time action. Some use a mixture of both. There are two clearly distinct

Solid world

types of Adventure games: those that are mappable, and those that are not.

It is the essence of an Adventure game to be able to feel that you are in a believable and solid world. If you pass over a large chasm on your way, you have every right to expect it to be in the same place when you come back. It is possible, if not essential, to construct a map as you explore. You can achieve great satisfaction from breaking through to new ground and filling in another blank area on the map.

Some smaller games do not have the necessary memory capacity and rely on other means. They sometimes have levels to their domain: the program only holds one level at a time and creates a new one from random every time you pass up, or down, to a new plane. The levels differ only in the strength of their inhabitants and the value of the treasures found, which usually means multiplying a base value by whatever level you are on. "Aha", says the author, "but the Evil Magician has cast such a spell on the cavern that the walls slide about and the exits move whenever you pass to another plane". Which just goes to show that if you document a flaw, it can become a feature.

Another major difference between games is something called the end-game. This is present in Adventure, Dungeon and most mappable variants. Once you have explored the passages and solved all the puzzles, the game changes gear and you are permitted to pass into some previously inaccessible inner sanctum when the ultimate challenge is thrown at you.

Sometimes these end games are mini-Adventures in themselves and can be excruciatingly difficult to solve. Such a grand-slam finale beckons the player to strive for an attainable goal. Other games, usually non-mappable ones, offer only an ever-increasing score as a reward. Admittedly, they never end, but they lack any soul-satisfying climax.

Name	Machine	Supplier	Approximate Price
Adventure	Apple	PDS	£14.95
Adventure	ZX-80/81	Artic computing	£7
Adventure	Atari	Maplin Electronics	£10
Adventure	UK 101	M Ward	£8
Adventureland	TRS-80	Instant Software	£12.50
Akalabeth	Apple	Gatepost	£21.50
Alien Adventure	Apple, Pet, TRS-80	Compukit	£3
Alien Labyrinth	Nascom 1 and 2	Program Power	£6.95
Beneath the Pyramids	Apple, Pet, TRS-80	Crystal Software	£15
Catacombs	Pet	Supersoft	£10
Creature Venture	TRS-80	SBD Software	£14.95
Crowley Manor	TRS-80	Micro Applications	£13.50
Cursed Chambers	Sharp	J W Wolstonecraft	£5
Datestones of Ryn	Apple	The Software House	£11
Death Dreadnought	TRS-80	Algray	£9.95
Deathmaze	TRS-80 level II, 16K	Essential Software	£10
Demon Dungeon	Acorn Atom	Program Power	£6.95
Dog Star Adventure	TRS-80	The Software House	£6
Dragonquest	TRS-80	Algray	£9.95
Dragons Fire	Apple	Pete and Pam Comps	£29.95
Dungeon of Death	Pet 8K	CT Software	£7.50
Escape (3-D)	TRS-80	Kansas City Supp	£7.50
Fantasyland 2041	Apple, Pet, TRS-80	Crystal Software	£30
Fracas	Apple	Gatepost	£13
Galactic Empire	TRS-80	Calisto Computer	£16.50
Galactic Quest	Apple, Pet, TRS-80	Crystal Software	£15
Galactic Saga	TRS-80	Calisto Computer	£12.50
Galactic Trilogy	TRS-80	Calisto Computer	£33
Ghost Town	TRS-80	Calisto Computer	£12.50
Hellfire Warrior	Apple	Pete and Pam Comps	£20.95
House of 30 Gables	TRS-80	Calisto Computer	£12.50
House of Usher	Apple, Pet, TRS-80	Crystal Software	£15
Imperial Walker	Apple, Pet, TRS-80	Crystal Software	£15
Jason and the Argonauts	Pet	Commodore	£5
Keys of Kraal	Nascom 1 and 2	Program Power	£8.95
Kid Venture	TRS-80	Calisto Computer	£12.50
Ky Temple of the Dragon King	Apple, Pet, TRS-80	Compukit	£3
Labyrinth (3-D)	TRS-80, level II, 16K	Essential Software	£10
Little Crystal	Apple, Pet, TRS-80	Crystal Software	£20
Local Call for Death	TRS-80	Calisto Computer	£16.50
Lord of the Rings	TRS-80, Video Genie	Kansa City	£9.50
Lost Dutchman's Gold	TRS-80	Algray	£9.95
Mad Hatter's Adventures	Apple	The Software House	£28
Microsoft Adventure	Apple	Pete and Pam Comps	£15.95
Mission Impossible	TRS-80	Calisto Computer	£12.50
Morlocs Tower	Apple	Pete and Pam Comps	£15.95
Mystery Fun House	TRS-80	Calisto Computer	£12.50
Mystery House	Apple	Spider Software	£13.95
New York Subway	Apple, Pet, TRS-80	Compukit	£3
Odyssey	Apple	Pete and Pam Comps	£15.95
Oldorf's Revenge	Apple	Spiders Software	£11.95
Pirate's Adventure	TRS-80	Calisto Computer	£12.50

It comes as a surprise to learn that Adventure is not restricted to computers, and there have been several efforts to tailor the concept for other media. The original board game of Dungeons and Dragons came first, and is still very popular.

There was even a book, published some years ago, with which you could construct your own Adventure-style plot. On reaching a certain point in the text, where our hero Mr Bloggins was poised before a door behind which he suspected a trap, the narration ended on the following note:

> If you think Mr Bloggins should enter the room, turn to page 118. If not, continue reading from page 95.

The story then continued, depending on your choice of plot. The whole book was fragmented in this way, and its limitations are obvious.

There have been stories in the computer trade papers based on people's alter-ego adventures experienced in a game and expanded into a true sword-and-sorcery piece. Attempts at constructing unstructured plots in literature hark back even as far as the old parlour game of Consequences. This idea spawned

Name	Machine	Supplier	Approximate Price
Pyramid of Doom	TRS-80	Calisto Computer	£12.50
Rescue at Rigel	Apple	Pete and Pam Comps	£15.95
Sands of Mars	Apple, Pet, TRS-80	Crystal Software	£20
Savage Island	TRS-80	Calisto Computer	£16.50
Six Micro Stories	TRS-80	Calisto Computer	£12.50
Slag	TRS-80	Calisto Computer	£12.50
Sleuth	TRS-80	The Software House	£9
Sorcerer's Castle	Pet	Commodore	£5
Spider Mountain Adventure	TRS-80	Algray	£9.95
Strange Odyssey	TRS-80	Calisto Computer	£12.50
Tarturian	TRS-80	SBD Software	£14.95
Tawala's Last Redoubt	TRS-80	SBD Software	£14.95
Temple of Apshai	Apple	Pete and Pam Comps	£20.95
The Count	TRS-80	Calisto Computer	£12.50
The Galactic Empire I	TRS-80	SBD Software	£12.95
The Galactic Revolution III	TRS-80	SBD Software	£12.95
The Galactic Trader II	TRS-80	SBD Software	£12.95
The Hitch-Hiker's Guide	Pet	Supersoft	£16
The Prisoner	Apple	Pete and Pam Comps	£15.95
The Wizard and the Princess	TRS-80	SBD Software	£17.95
Troll's Tunnel	Apple, Pet, TRS-80	Compukit	£3
Two Heads of the Coin	TRS-80	Calisto Computer	£16.50
Underground Quest	ZX-80/81	David Blagden	£4
Vampire Castle	Apple, Pet, TRS-80	Compukit	£3
Voodoo Castle	TRS-80	Calisto Computer	£12.50
Waterloo II	Apple, Pet, TRS-80	Crystal Software	£25
Wizardry	Apple	Pete and Pam Comps	£29.95
Wizards Mountain	TRS-80	The Software House	£9
World War III	Apple, Pet, TRS-80	Crystal Software	£15
Zombie Forest	Apple, Pet, TRS-80	Compukit	£3
Zork	TRS-80	The Software House	£22

Algray, Algray House, 33 Bradbury Street, Barnsley, West Yorkshire. (0226) 83199.
Artic Computing, 396 James Reckitt Avenue, Hull HU8 0JA.
David Blagden, ZX-80/81 User's Club, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.
Calisto Computers, 119 John Bright Street, Birmingham B1 1BE. 021-632 6458.
Compukit, 290 Station Road, Stechford, Birmingham B33 8QR.
Crystal Computer, 12130 Steffs Ct., San Martin, California 95046, USA. (408) 683 0696.
Essential Software, 47 Brunswick Centre, London WC1N 1AF. 01-837 3154.
Gatepost, Gate Microsystems, The Nethergate Centre, 35 Yeaman Shore, Dundee.
Pete and Pam Computers, 98 Moyser Road, London SW16 6SH. 01-677 2052/7341.
PDS, Professional Data Systems, Carne House, Markland Hill, Chorley New Road, Bolton, Greater Manchester. (0204) 493816.
Program Power, 5 Wembley Road, Leeds, West Yorkshire LS7 2LK. (0532) 683186.
SBD Software, 15 Jocelyn Road, Richmond TW9 2TJ. 01-948 0461.
Spider Software, 98 Avondale Road, South Croydon, Surrey. 01-661 2365.
Supersoft, 10-14 Canning Road, Wealdstone, Harrow, Middlesex. 01-861 1166.
The Software House, 146 Oxford Street, London W1. 01-637 2108.
J. W. Wolstonecraft, Sagar Fold, Bleasdale, Preston. (Chipping) 327 09956.

These Adventure-style games were available in November 1981. At least one known supplier is given for each game, though it may be available elsewhere — it can pay you to shop around as prices vary considerably.

some extremely funny computer games that inserted words into a pre-defined story at random.

Television has taken a stab at similar ideas. In the mid-1960s there was a children's serial that used to end each week with the invitation for people to write in with the script for the next episode. In 1979 the BBC brought out a programme called *The Adventure Game*, a thinly-disguised attempt to grab the popularity of the computer game. The show had three celebrities, held captive in an alien cave system, who used various obstacles to retrieve a special crystal needed for their spaceship. The show was said to be unscripted and the dungeon master was a friendly alien who appeared offering help whenever they got stuck. They even sat at a computer terminal and played a variation of Adventure at the start of each show.

Solving teasers

More recently, the BBC has screened *Now, Get Out Of That*, in which a group of strangers are dropped into the countryside pretending to be enemy saboteurs. They have to solve the usual mental and physical teasers before finally reaching the end-game of stealing a solar-powered battery from a castle.

Perhaps the most successful of this type of show was ITV's *Masterspy*, screened in 1978. It was really a game or quiz show, with three contestants pretending to be secret agents training for a mission. The first half of each show was a series of clever mental tests to score "agent ratings". The two higher scorers went on into the second half to participate in a strange play in which they were free to say and do anything, while the other parts were taken by actors.

A tremendous amount of imagination and effort went into each episode and the actors always managed to steer the contestants without spoiling the illusion. The dungeon master was William Franklyn and it was he who helped to make it all believable. Sadly, the show ended after the second series but it still remains one of TV's best attempts at creating a fictitious world for contestants.

More sophisticated programming languages and innovations in the hardware will allow future authors of Adventure games much greater scope. As memory becomes cheaper and on-line disc storage readily available to more users, Adventure games will undergo a dramatic increase in size.

Restrictions lifted

Once the storage space restrictions are lifted, many more "rooms" and their various connecting passages will be available for the games. Fast-access discs can hold enormous databases for Adventure programs and will lead to even more mind-stretching puzzles to solve. Perhaps there might be a version of Adventure implemented through the viewdata terminals tapping the mammoth databases there.

There will be a move towards graphical representation of scenes in the games. There are already Adventure games that use graphics to a limited extent. Future games will not just have "plan view" graphics but true isometric images and colour.

The recent television series *Cosmos* contained several computer-generated scenes of simulated fly-bys of planets as viewed from a passing spaceship. These images are realistic enough to equal modern photography, and their smooth movements rival conventional animation. Such software could be used to create vivid scenes on a screen in which objects can be manipulated and various creatures can move around a fictitious landscape in real time.

In due course, we will have true three-dimensional images using red/green overlays or holographics. A three-dimensional Space Invaders computer game using holography techniques has already been aired at a computer-games exhibition in the United States.

(continued on page 93)

COMMAND-O ON TRIAL!

If you own a PET or CBM computer with disks then you ought to have a COMMAND-O chip. It's got all the facilities of that other chip (can't think of the name), plus BLEEP, EXECUTE, INITIALIZE, PRINT USING, AUTO-REPEAT — and you can scroll a program listing up and down the screen! There are lots more functions, but perhaps the best way to learn about COMMAND-O is to use one. If you order a COMMAND-O chip from SUPERSOFT before 31st March you'll qualify for our special money back offer. Just return it in good condition within 10 days and we'll refund your money in full! COMMAND-O is for Basic 4 users only and costs £59.95 plus VAT. It fits in the UD3 or UD12 socket and comes with a comprehensive, but readable manual.

ARROW is a chip that will be of particular interest for committed tape users — because it will LOAD, SAVE and VERIFY at 7 to 8 times normal speed! There are lots more features for just £30 plus VAT, but since we're making the same money back offer why not try it out. Don't forget to tell us which machine you own (it works on all models except the original Old Roms) and which socket is available.

FREE TO PET OWNERS . . .

Our 1982 catalogue is now available, and it's absolutely free to PET owners (tell us what equipment you've got and we'll add you to our computerised mailing list!)

New programs in the catalogue include SIMPLICALC (£26 on tape, £32 on disk), INSTRING (£10) which searches for one string within another, and LINK & SHRINK (also £10), a fascinating program that saves space by joining Basic lines together.

80 COLUMN GRAPHICS

Yes, at long last the HR-80 HIGH RESOLUTION GRAPHICS BOARD is available. And we've managed to hold the price at just £149 plus VAT! The resolution is 320 by 200, the same as on our HR-40 board, and of course the board has 8K of its own RAM plus GRAPHIX utility software in a chip. Write or telephone for an information sheet or for further details about any SUPERSOFT products.

ADD 15% VAT TO PRICES – POST & PACKING IS FREE!

SUPERSOFT

First Floor, 10-14 Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ, England.
Telephone: 01-861 1166.

● Circle No. 163

PROGRAMMER

Practical Computing is looking for a programmer-journalist. Programming skill is more important to us than journalism, so don't be put-off by lack of experience in that field. If you have:

i) At least two year's experience of computing
ii) At least two languages
iii) At least one machine code
iv) Experience of working inside operating systems
v) The ability to write clear English

send a CV and examples of your work to:

The Editor
Practical Computing
Quadrant House
Sutton
SM2 5AS

The post will be Grade 7, paid £6,463

kai

203A BELSIZE ROAD, LONDON NW6

TAKE A PROFESSIONAL DECISION . . . . .

AND YOU CAN SLEEP BETTER AT NIGHTS, BECAUSE KAI HAS NOW INTRODUCED A BUSINESS PACKAGE THAT INCLUDES:—

★ **PROFESSIONAL CONSULTANCY AND ADVICE**
★ **INSTALLATION AND TRAINING FOR FIRST TIME USERS**
★ **TIMELY RESPONSE AND HELPFUL PERSONAL SERVICE**
★ ***TWO YEAR* MAINTENANCE AND SUPPORT PACKAGE.**

FIND OUT MORE TODAY — CALL JOHN CHANG ON 01-328 3968 OR 01-328 7038.

FOR APPLICATIONS SEE PAGE 186

apple computer

PLUS OTHER GOOD MICROS

● Circle No. 164

(continued from page 91)

There is already an arcade game that creates a simple landscape. It shows a view as seen from the forward slit of a tank turret. As you manipulate the joystick, you can turn the turret and your view pans across a chequered horizontal plane filled with symmetrical geometric polyhedra and other tanks. These shapes obey the laws of perspective, giving the impression that your tank is moving forward across the plane.

Wire-shape effect

One major drawback is that all the edges of the figures are visible at once, giving a wire-shape effect rather than a true solid feel. Nevertheless, games like this are a big step forward in creating a world within the computer. Perhaps we may even see some form of Adventure game appearing in arcades in the future.

Although these advances are the logical step in computer graphics for Adventure games, the most startling development comes from an improbable source, the American Central Intelligence Agency. The CIA is concerned that its agents may be unfamiliar with the layout of the streets of a town when they are acting as bodyguard or are on other duties. The CIA has developed a method of familiarising its agents with the streets in towns where they will be operating, based on a special form of video disc. A car travelling along all the streets of the town films the view from the driver's seat. The film is transferred on to a special video disc — which is simply a device for the random access of visual information. With the aid of a micro and a monitor, trainees can then "drive" through the town without ever going there. At each junction, the driver decides which way to go, and the relevant section of film is selected off the disc with no loss of continuity.

Does the future hold Adventure video discs? Perhaps finely-detailed models and animation will be used for scenes, or we may find ourselves roaming down passages that tower over us on the scale of a Cecil B De Mille film set.

Adventure games of the future will also be able to use voice input and output in conjunction with the graphical images. You will be able to hear characters speak, and sound-effects will come into their own as in no other game. Hear the crackling of fires, the clank of swords, the screaming cries of things not of this world!

New horizons

On the software side, we might see a special Adventure programming language which will make it easier for non-specialists to write new Adventures and thereby open new horizons to famous conventional authors. Imagine an Adventure program written by Isaac Asimov or Harold Robbins, or perhaps moving full circle with a game written by Michael Moorcock.

A further software development for future games would be the introduction of a time-sharing aspect. There are, as yet, no Adventure games that can support simultaneous access where one player can enter a room and meet another player who is also exploring the passages. Such a game could already be written using the resource-sharing minis and the capabilities of networking micros together, and several people using separate terminals could participate in the same game. They could enter the passageways together, split up to explore, and meet back at some prominent landmark to share their treasures. To each player, the other players would just be other objects in the Adventure universe.

A fantasy universe

You might be able to talk to one another, leave each other messages chalked on the walls of a cavern, or even fight and kill each other. Could gang warfare break out in Adventureland? You are not restricted by distance either. With modern telecommunications and satellites, you could be accompanied into the caves by someone sitting at a terminal in Australia.

Most current Adventures take place in a fantasy universe, but this need not be so. Why not a game where you can wander down faithful renderings of the streets of London? This would be handy for London cabbies "on the knowledge" or tourists finding their way round. You could even enter the Underground and catch a train. You could set a game in Medieval England populated with famous kings and queens and containing realistic descriptions of contemporary scenes.

Repeatable functions for limitless mazes

Graham Relf leads you down dark, winding corridors, through deep mines shaken by earthquakes in this maze game. This Basic program means you can generate as large a maze as you need — on even the smallest micro.

MANY EXCELLENT games are marred by a limited capacity for storing mazes and the computing time required to set up the data at the start of each run. When the details of the game parameters are stored byte by byte in memory, mazes and other game boards are restricted to a few hundred positions or cells on all but the largest systems.

There are ways, however, to overcome this problem so that even a humble 4K machine can guide the game player round labyrinths which are large enough to tax the most enthusiastic game players.

Learning the trick

The trick is, in effect, to store the details of the maze in a mathematical function. Suitable functions are already used in some methods of generating random numbers. To generate a maze, they must be repeatable random numbers: given a set of parameters such as position co-ordinates the function must always provide the same number, but that number must appear to vary randomly as the parameters change.

Consider the following simple algorithm for generating random numbers:

```
N = 0.5
FOR I = 1 TO 1000
        N = FRAC ( ( π + N)⁵ )
        PRINT N
NEXT I
```

It prints 1,000 random numbers between zero and one.

On the first line of the algorithm N is set with a seed value. In the For loop it is changed to successive random values — for purists, pseudo-random values. The function FRAC returns the fractional part of its argument. It is not a standard Basic function but it can be reproduced by

X – INT (X)

where INT(X) is usually available as a standard function which returns the integer part of its argument. FIX(X) is an alternative.

It is the process of discarding the most significant digits of N which makes the algorithm appear to be random. A similar principle can be applied to any function. For example, the third and fourth digits of cos(X) for various X gives two-digit results which appear to be fairly random, provided that the values of X are not too close together.

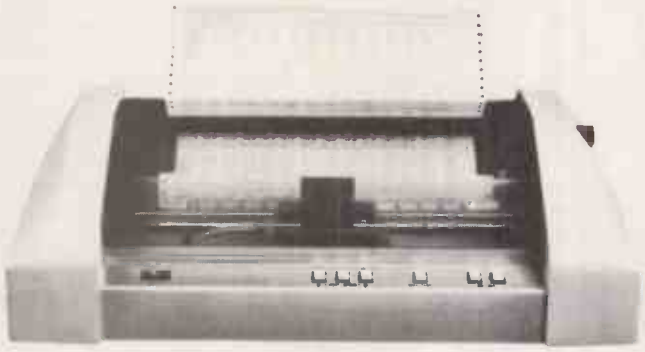
One important feature is that while the results are random for different X, the same number is always returned by the function for any particular X. The Basic statements in listing 1 extract the third and fourth digits of cos(X).

Mazes are two- or three-dimensional structures which can be defined by random functions of two or three co-ordinates. The function indicates whether any

(continued on page 95)

What do British Telecom, Mobil, Kalamazoo, BL Limited, Rolls-Royce, ICI and Plessey all have in common?

They all use Anadex printers because they are reliable and rugged.



Whether for use in industry, commerce or high technology, the DP-9000 and DP-9500 series fulfil the need for speed, dependability and versatility.

These machines offer:
* Print speeds up to 200 cps.
* Three built-in interfaces with expandable buffers.
* High density graphics as standard.

PLUS printing widths of 80/132/220 columns and a host of other features – still the finest price/performance available.

Join the big league – buy Anadex.

. . . Anadex

Anadex Ltd.

Details from Anadex Limited, Weaver House, Station Road, Hook, Basingstoke, Hants. Tel (025672) 3401 Telex 858762 Anadex G.

A1 STOCKISTS

ENGLAND: AVON Wilkes Computing Ltd Tel: 0272 290651 **BERKSHIRE** Riva Terminals Ltd Tel: 03447 5193 **CAMBRIDGESHIRE** Comart Ltd Tel: 0480 215005 **DERBYSHIRE** Midlectron Ltd Tel: 077 382 6811 **HERTFORDSHIRE** Data Design Techniques Ltd Tel: 01 207 1717 Data Efficiency Tel: 0442 57137 **LANCASHIRE** Keytech Engineering Ltd Tel: 061 834 9244 Stack Computers Ltd Tel: 051 933 5511 **WILTSHIRE** Kode Services Ltd Tel: 0249 813771 **SCOTLAND: FIFE** C S Scotland Tel: 0592 773710 **MIDLOTHIAN** Microcentre Ltd Tel: 031 556 7354 **STRATHCLYDE** Robox Ltd Tel:041 221 5402 **WALES: SOUTH GLAMORGAN** Datatype Terminals Ltd Tel: 063 33 65307

● Circle No. 165

(continued from page 93)

given location is open corridor or solid wall. If the location is defined by co-ordinates X, Y and Z — for unit measurements east, north and downwards — then a possible function would be computed by the Basic subroutine:

```
9000 U = 100*SQR (X*
X + Y*Y*Z)
9010 W = U – INT (U)
9020 RETURN
```

Note that negative Z should be avoided before calling this subroutine. If W > T, where T is a constant "threshold" value set at the beginning of the program, a wall is present; otherwise the given co-ordinates X, Y, Z define a corridor location.

On the threshold

The maze represented by this function is clearly enormous. The co-ordinates are restricted only by the number of significant figures held for each variable in the particular computer. It requires no initial setting up and no data storage except for the threshold value, T. This threshold may be useful in Adventure games: by varying it only slightly some cells change from wall to corridor and vice versa, while most remain unaltered. In this way "earthquakes" can be simulated.

Once the function has been calculated for a given location the value returned, W, can provide further information about that location. By examining particular digits or groups of digits, and determining whether they lie within predetermined ranges, events or objects can be identified for the given location from preset tables which apply throughout the maze.

The probability of particular events or objects can be programmed into such tests. Suppose W has been calculated for the explorer's current location. Programming the Basic equivalent of

V = digits 4, 5 and 6 of W
if V >= 20 and V < 60
then there is a monster here; the type also depends on V

gives a probability of (60-20)/1000 = 0.04 of finding a monster at any location in the corridors — assuming that the random function is sufficiently random.

Table of objects

Such methods can be used to determine numerous attributes for any location, each with different probabilities of occurring. Notice that these attributes are not affected at all by the earthquakes previously described. The snag with this technique is that objects cannot be moved, but are frozen into the random-number function. One way to avoid this problem is to keep a table of objects which the explorer has moved or altered. Such a table will be relatively small and can be organised so that the program can quickly determine whether there are any entries in it for the current location, e.g., by hash-coding the co-ordinates. This is a small price to pay for the other benefits.

Listing 2 shows a development program which experiments with these techniques. It is written in a general Basic, avoiding graphics, so that it will run on most machines, though it was developed in Tandy level-II Basic.

The program accepts six direction commands: east, north, west, south, up and down, each of which may be abbreviated to the initial letter. After each move, the initial letters of the directions of all open corridors leaving the new location are displayed. Invalid commands or attempts to move into the wall are greeted with the response "Impossible!".

When Z=1 you have reached ground level, and further upward movement is prevented. The program starts at ground level, where you may wander freely until you find a mineshaft going down. There are some very deep mines, but it is possible to get back out of them. Here lies the joy of this technique: by using various functions of the type described you can invent your own structures and explore them without knowing in advance what you will find.

The particular function used in this program is only an example and probably a rather poor one at that because it takes a significant time to compute. A "torch" command, finding the length of a straight corridor, can take several seconds to give an answer. You may well be able to develop faster functions with the desired properties, particularly if you are willing to experiment with assembly code. By using several such functions, very complicated game structures can be created, even in the smallest machines.

Listing 2.

```
10 PRINT 'MAMMOTH MAZE IN 2.5 K-BYTES     BY G.T.RELF'
20 REM  SET STARTING POSITION (EAST, WEST, DOWN):
30 X=103 : Y=97 : Z=1
40 REM  SET THRESHOLD:
50 T=0.3
60 REM  RANDOMISE FOR EARTHQUAKES:
70 RANDOM
80 REM  INSERT ANY OTHER INITIALISING STATEMENTS HERE.
90 REM  MAIN LOOP:
100 REM  COMPUTE PROPERTIES OF CURRENT LOCATION:
110 GOSUB 250
120 REM  GET COMMAND & BRANCH ACCORDINGLY:
130 INPUT 'COMMAND'; CM$
140 CM$=LEFT$(CM$,1)
150 IF CM$='N' THEN 490
160 IF CM$='E' THEN 530
170 IF CM$='W' THEN 570
180 IF CM$='S' THEN 610
190 IF CM$='U' THEN 650
200 IF CM$='D' THEN 690
210 PRINT 'IMPOSSIBLE!'
220 GOTO 110
230 REM  END OF MAIN LOOP.
240 REM  COMPUTE ATTRIBUTES OF CURRENT LOCATION:
250 V1=INT(W*1000)
260 IF V1>35 AND V1<39 AND Z>1
    THEN PRINT 'HERE IS A CROCK OF GOLD!'
270 REM (YOU WON'T FIND CROCKS OF GOLD
         JUST LYING ON THE GROUND!)
280 REM  INSERT OTHER ATTRIBUTE TESTS HERE:
290 REM  CHECK FOR EARTHQUAKES:
300 IF RND(1000)=9
    THEN PRINT 'RUMBLE, RUMBLE ...' : T=T+0.2*RND(0)-0.1
310 REM  INSERT OTHER LOCATION-INDEPENDENT TESTS HERE.
320 REM  IDENTIFY CORRIDORS FROM CURRENT LOCATION (CHANGES W):
330 IF Z=1 THEN 440
340 PRINT 'CORRIDORS : '; : NC=0
350 X=X+1 : GOSUB 720 : IF W<T THEN PRINT 'E '; : NC=NC+1
360 X=X-2 : GOSUB 720 : X=X+1 :
    IF W<T THEN PRINT 'W '; : NC=NC+1
370 Y=Y+1 : GOSUB 720 : IF W<T THEN PRINT 'N '; : NC=NC+1
380 Y=Y-2 : GOSUB 720 : Y=Y+1 :
    IF W<T THEN PRINT 'S '; : NC=NC+1
390 Z=Z+1 : GOSUB 720 : IF W<T THEN PRINT 'D '; : NC=NC+1
400 Z=Z-2 : GOSUB 720 : Z=Z+1 :
    IF W<T OR Z=2 THEN PRINT 'U '; : NC=NC+1
410 IF NC=0 THEN PRINT 'NONE - THE EARTHQUAKE HAS TRAPPED YOU!'
420 PRINT
430 RETURN
440 PRINT 'GROUND LEVEL.'
450 Z=Z+1 : GOSUB 720 : Z=Z-1
460 IF W<T THEN PRINT 'SHAFT DESCENDS FROM HERE.'
470 RETURN
480 REM  MOVE NORTH:
490 Y=Y+1 : IF Z=1 THEN 110
500 GOSUB 720 : IF W<T THEN 110
510 Y=Y-1 : GOTO 210
520 REM  MOVE EAST:
530 X=X+1 : IF Z=1 THEN 110
540 GOSUB 720 : IF W<T THEN 110
550 X=X-1 : GOTO 210
560 REM  MOVE WEST:
570 X=X-1 : IF Z=1 THEN 110
580 GOSUB 720 : IF W<T THEN 110
590 X=X+1 : GOTO 210
600 REM  MOVE SOUTH:
610 Y=Y-1 : IF Z=1 THEN 110
620 GOSUB 720 : IF W<T THEN 110
630 Y=Y+1 : GOTO 210
640 REM  MOVE UP:
650 IF Z=1 THEN 210
655 Z=Z-1 : IF Z=1 THEN 110
660 GOSUB 720 : IF W<T THEN 110
670 Z=Z+1 : GOTO 210
680 REM  MOVE DOWN:
690 Z=Z+1 : GOSUB 720 : IF W<T THEN 110
700 Z=Z-1 : GOTO 210
710 REM  RANDOM FUNCTION:
720 U=100*SQR(X*X+Y*Y*Z)
730 W=U-INT(U)
740 RETURN
```

Listing 1.

```
10 INPUT X
20 C = COS (X)
30 C = C*100          Puts the third and fourth digits immediately to right
                        of decimal point
40 C = ABS (C)        Ignore sign for next step of work.
50 C = C – INT (C)    Chops off integer part.
60 C = C*100          Puts the digits to left of decimal point.
70 C = INT (C)        Chops off the fractional part.
80 PRINT C
```

HOW TO GET MORE FROM YOUR MICRO

CP/M* Courses for micro computer users

A 'must' for Micro Users. Learn how to get the most out of your system.

OBJECTIVES

To familiarise the new user with the operation of the typical hardware attached to a disc-based Z80 microprocessor system.

To give the user an understanding of the facilities available in the operating system CP/M, of its management of disc files, and of its adaption to different hardware configurations.

To give the user hands-on experience which enables this knowledge to be put to practical use.

To acquaint the user with the range of programming languages and packages which are compatible with CP/M.

Wordstar † Wordprocessing

OBJECTIVES

To give the user an understanding of the facilities available in the Wordstar/Mailmerge Wordprocessing System.

To give the user hands-on experience which enables this knowledge to be put to practical use.

Programming in Basic

OBJECTIVES

To give the student a thorough understanding of the BASIC language.

To enable the student to put the knowledge gained into practical use, facilitated by hands-on sessions and practical exercises.

Programming in CIS Cobol**

OBJECTIVES

To give a sound knowledge of the Ansi '74 Cobol programming language, highlighting differences between various dialects particularly CIS Cobol.

To provide an understanding of structured programming techniques as used in CIS Cobol.

Programming in PASCAL

OBJECTIVES

To provide an understanding of structured programming techniques as used in PASCAL.

To give a thorough knowledge of the PASCAL programming language.

To provide practical experience in using PASCAL on a microcomputer.

CONTACT:

The Courses Secretary,
Computer Training & Education Centre Ltd,
102-108 Clerkenwell Road,
London EC1. 01-251 4010.

*CP/M is the T/M of Digital Research Corp.
† Wordstar is the T/M of Micropro International Corp.
**CIS Cobol is the T/M of Microfocus.

INTRODUCING COMPUTERS

A series of 1-day courses for businessmen

AN INTRODUCTION TO COMPUTERS

MANAGING COMPUTERS IN YOUR BUSINESS

MANAGING WORD PROCESSING IN YOUR BUSINESS

(Course fees include lunch)

A wide range of hardware is available for practical work.

CTEC

A professional organisation with first class training facilities in central London.

Please send me further information on the above courses

Name .....

Position .....

Company .....

Address .....

.....Tel. No. PC3

● **Circle No. 166**

Heart of the labyrinth

Find your way to the centre of the maze with this intriguing machine-portable game presented by P J Goss.

THIS PROGRAM creates a labyrinth through which the player has to move to find the centre. Four different sizes can be created with cells ranging from five by five to 11 by 11. The labyrinth is scrolled up the screen, leaving the player to move around in the dark. Occasionally the player is told how far away the centre is.

The program makes extensive use of arrays. The labyrinth is first created with all the cell walls intact and with no paths. This is done when array A is initiated. Arrays B and C are zeroed ready for use later on.

A path is then randomly created from the centre. A wall is removed from either the north, south, east or west side of a cell and from the adjoining cell until a continuous path is found to an outside wall.

```
10REM LABYRINTH P.J.GOSS 2-9-81
20DIM A(24,24),B(121),C(121)
30PRINT "********** LABYRINTH **********"
40PRINT
50PRINT "FOUR SIZES OF LABYRINTH ARE AVAILABLE"
60PRINT "AFTER SELECTING THE REQUIRED SIZE A"
70PRINT "LABYRINTH WILL BE DISPLAYED AND THEN"
80PRINT "DISAPPEAR FROM THE SCREEN."
90PRINT "TO MOVE AROUND THE LABYRINTH YOU ARE"
100PRINT "ASKED TO TYPE DIRECTIONS IN THE FORM"
110PRINT "OF N,S,E OR W."
120PRINT "TO FINISH TYPE F"
130PRINT
140PRINT "SIZE";
150INPUT L
160IF L<1OR L>4GOTO 130
170LET M=7+(INT(L)*4)
180GOTO 200
190REM******INITIATE ALL ARRAYS******
200FOR I=2TO M+1STEP 2
210FOR J=2TO M+1STEP 2
220LET A(I,J)=0
230LET A(I-1,J-1)=1
240LET A(I,J-1)=2
250LET A(I-1,J)=3
260NEXT J
270NEXT I
280LET A((M+1)/2,(M+1)/2)=4
290GOTO 300
300FOR I=1TO 121
310LET B(I)=C(I)=0
320NEXT I
330REM******SELECT RANDOM PATH FROM CENTRE******
340LET D=1
350LET S=T=(M+1)/2
360LET B(1)=C(1)=S
```

(continued on next page)

Tests are made to stop the path turning back on itself, and to ensure that it is created with a pre-defined minimum length. The relevant values to signify the absence of a wall are stored in array A. The cell co-ordinates for the path to the centre are stored in arrays B and C.

The remainder of the labyrinth is created from the player's starting point. Tests are made in a clockwise sequence on the adjoining cells for a possible path. When one is found it continues until a dead end is reached. Further paths are then taken off the main route in the same way; when no further paths can be taken off the main route they are then taken off the secondary paths until the labyrinth is complete.

A subroutine is used to display the contents of the array A in a graphical form. The player's starting position is marked with a "?" and the centre with an "X". The screen is cleared by 23 line-feeds and the player is asked to move. If the display disappears too quickly a delay can be inserted before line 1340.

After each move the program decides if you have walked into a wall or tried to walk out of the labyrinth. A variable P keeps track of how far away the player is from the centre, and is displayed every six, five, four or three moves, depending on the size of the labyrinth. A continuous update of steps to the centre can be produced by making line 1780 an unconditional jump,

1780 GOTO 1800

When P=0 the game is over and the labyrinth is displayed again, but this time showing the path to the centre and the final position of the player. The same will happen if you give up before reaching the centre by typing F.

(continued from previous page)

```
0037  370LET Z=0
0038  380GOTO INT(RND(1)*4)+10F 400,500,600,700,370
0039  390REM******NORTHERN PATH SELECT******
0040  400IF T-2=0GOTO 460
0041  410IF A[S,T-2]=40R Z=1GOTO 380
0042  420LET Z=1
0043  430LET A[S,T-1]=0
0044  440LET T=T-2
0045  450GOTO 750
0046  460IF D<M-(INT(M/2))GOTO 380
0047  470LET A[S,T-1]=0
0048  480GOTO 830
0049  490REM******EASTERN PATH SELECT******
0050  500IF S+2=M+1GOTO 560
0051  510IF A[S+2,T]=40R Z=2GOTO 380
0052  520LET Z=2
0053  530LET A[S+1,T]=5
0054  540LET S=S+2
0055  550GOTO 750
0056  560IF D<M-(INT(M/2))GOTO 380
0057  570LET A[S+1,T]=5
0058  580GOTO 830
0059  590REM******SOUTHERN PATH SELECT******
0060  600IF T+2=M+1GOTO 660
0061  610IF A[S,T+2]=40R Z=3GOTO 380
0062  620LET Z=3
0063  630LET A[S,T+1]=0
0064  640LET T=T+2
0065  650GOTO 750
0066  660IF D<M-(INT(M/2))GOTO 380
0067  670LET A[S,T+1]=0
0068  680GOTO 830
0069  690REM******WESTERN PATH SELECT******
0070  700IF S-2=0GOTO 800
0071  710IF A[S-2,T]=40R Z=4GOTO 380
0072  720LET Z=4
0073  730LET A[S-1,T]=5
0074  740LET S=S-2
0075  750LET D=D+1
0076  760LET A[S,T]=4
0077  770LET B[D]=S
0078  780LET C[D]=T
0079  790GOTO 380
0080  800IF D<M-(INT(M/2))GOTO 380
0081  810LET A[S-1,T]=5
0082  820REM******CREATE REMAINDER OF LABYRINTH******
0083  830LET E=F=G=D
0084  840FOR K=D+1TO ((M-1)/2)^2
0085  850REM******TEST FOR NORTH WALL BREAK******
0086  860IF C[E]-2=0GOTO 940
0087  870IF A[B[E],C[E]-2]=4GOTO 940
0088  880LET A[B[E],C[E]-1]=0
0089  890LET A[B[E],C[E]-2]=4
0090  900LET B[K]=B[E]
0091  910LET C[K]=C[E]-2
0092  920GOTO 1160
0093  930REM******TEST FOR SOUTH WALL BREAK******
0094  940IF B[E]+2=M+1GOTO 1020
0095  950IF A[B[E]+2,C[E]]=4GOTO 1020
0096  960LET A[B[E]+1,C[E]]=5
0097  970LET A[B[E]+2,C[E]]=4
0098  980LET B[K]=B[E]+2
0099  990LET C[K]=C[E]
0100  1000GOTO 1160
0101  1010REM******TEST FOR EAST WALL BREAK******
0102  1020IF C[E]+2=M+1GOTO 1100
0103  1030IF A[B[E],C[E]+2]=4GOTO 1100
0104  1040LET A[B[E],C[E]+1]=0
0105  1050LET A[B[E],C[E]+2]=4
0106  1060LET B[K]=B[E]
0107  1070LET C[K]=C[E]+2
0108  1080GOTO 1160
0109  1090REM******TEST FOR WEST WALL BREAK******
0110  1100IF B[E]-2=0GOTO 1190
0111  1110IF A[B[E]-2,C[E]]=4GOTO 1190
0112  1120LET A[B[E]-1,C[E]]=5
0113  1130LET A[B[E]-2,C[E]]=4
0114  1140LET B[K]=B[E]-2
0115  1150LET C[K]=C[E]
0116  1160LET E=K
0117  1170GOTO 1270
0118  1180REM******TEST FOR PATHS OFF MAIN
          ROUTE******
0119  1190IF F=2GOTO 1240
0120  1200LET F=F-1
0121  1210LET E=F
0122  1220GOTO 860
0123  1230REM******TEST FOR PATHS OFF PREVIOUS
          PATHS******
0124  1240LET G=G+1
0125  1250LET E=G
0126  1260GOTO 860
0127  1270NEXT K
0128  1280REM******DISPLAY LABYRINTH******
0129  1290LET A[B[D],C[D]]=7
0130  1300LET A[(M+1)/2,(M+1)/2]=6
0131  1310PRINT
0132  1320PRINT
0133  1330GOSUB 2040
0134  1340REM******CLEAR SCREEN******
0135  1350FOR I=1TO 23
0136  1360PRINT
0137  1370NEXT I
0138  1380REM******MOVE PLAYER TEST FOR COLLISION
          AND EXIT
0139  1390LET S=B[D]
0140  1400LET T=C[D]
0141  1410LET P=D-1
0142  1420LET N=D
0143  1430LET W=R=V=0
0144  1440PRINT
0145  1450PRINT "N,S,E OR W"
0146  1460INPUT A$
0147  1470IF A$="N"GOTO 1530
0148  1480IF A$="S"GOTO 1570
0149  1490IF A$="E"GOTO 1610
0150  1500IF A$="W"GOTO 1650
0151  1510IF A$="F"GOTO 1960
0152  1520GOTO 1440
0153  1530IF A[S,T-1]=2GOTO 1850
0154  1540IF T-2=0GOTO 1890
0155  1550LET T=T-2
0156  1560GOTO 1690
0157  1570IF A[S,T+1]=2GOTO 1850
0158  1580IF T+2=M+1GOTO 1890
0159  1590LET T=T+2
0160  1600GOTO 1690
0161  1610IF A[S+1,T]=3GOTO 1850
0162  1620IF S+2=M+1GOTO 1890
0163  1630LET S=S+2
0164  1640GOTO 1690
0165  1650IF A[S-1,T]=3GOTO 1850
0166  1660IF S-2=0GOTO 1890
0167  1670LET S=S-2
0168  1680REM******CALCULATE STEPS TO CENTRE******
0169  1690FOR I=1TO ((M-1)/2)^2
0170  1700IF S=B[I]AND T=C[I]GOTO 1720
0171  1710GOTO 1750
0172  1720IF I<NLET P=P-1
0173  1730IF I>NLET P=P+1
0174  1740LET N=I
0175  1750NEXT I
0176  1760LET R=R+1
0177  1770IF P=0GOTO 1930
0178  1780IF R=7-LGOTO 1800
0179  1790GOTO 1440
0180  1800LET V=V+R
0181  1810LET R=0
0182  1820PRINT
0183  1830PRINT "NUMBER OF STEPS TO CENTRE ARE "P
0184  1840GOTO 1440
0185  1850PRINT
0186  1860PRINT "OUCH! - YOU WALKED INTO A WALL"
0187  1870LET W=W+1
0188  1880GOTO 1440
0189  1890PRINT
0190  1900PRINT "YOU HAVE JUST TRIED TO WALK OUT"
0191  1910PRINT "OF THE LABYRINTH"
0192  1920GOTO 1440
0193  1930PRINT
0194  1940PRINT "YOU HAVE FOUND THE CENTRE IN "V+R+W
0195  1950PRINT "NUMBER OF BRUISES "W
0196  1960FOR I=2TO D
0197  1970LET A[B[I],C[I]]=8
0198  1980NEXT I
0199  1990LET A[(M+1)/2,(M+1)/2]=6
0200  2000LET A[S,T]=7
0201  2010GOSUB 2040
0202  2020GOTO 2190
0203  2030REM******LABYRINTH DISPLAY ROUTINE******
0204  2040FOR J=1TO M
0205  2050FOR I=1TO M
0206  2060IF A[I,J]=0PRINT "   ";
0207  2070IF A[I,J]=1PRINT "+";
0208  2080IF A[I,J]=2PRINT "---";
0209  2090IF A[I,J]=3PRINT "|";
0210  2100IF A[I,J]=4PRINT "   ";
0211  2110IF A[I,J]=5PRINT " ";
0212  2120IF A[I,J]=6PRINT " X ";
0213  2130IF A[I,J]=7PRINT " ? ";
0214  2140IF A[I,J]=8PRINT " * ";
0215  2150NEXT I
0216  2160PRINT " "
0217  2170NEXT J
0218  2180RETURN
0219  2190END
```

British Genius

For Price Performance the Best Microcomputer Available

Multi-purpose low-cost micro-computing for the professional – the British Genius – the sophisticated business system for those who require the full range of advanced computing facilities without the associated expense.

- Z80 Microprocessor and CP/M *
- 64K Ram
- Detachable QWERTY keyboard, numeric and cursor control pads
- 61 programmable function keys
- RS232 Serial and Centronics Interfaces
- Reverse Video and Graphics
- GPIB Option
- 24 x 80 Green Display
- Twin 5" Floppy Drives – capacity 320K or 700K
- Twin 8" Floppy Drives giving 1.2M or 2.4 M
- Single 8" Floppy and one integral Winchester hard disk – 4.8M
- Single 8" Floppy and one integral Winchester hard disk – 9.0M

* CP/M is a trademark of Digital Equipment Corporation

The British Genius caters for a wide variety of applications including Order Processing, Invoicing, Stock Control, Ledger Accounting. Micro Solution offer a comprehensive range of well tried ready to run Software packages. Using the 61 function keys and the proven WORDSTAR software the British Genius is second to none as a word-processor. Furthermore the British Genius will talk (asychronously) to almost any other computer and transfer files to and from that computer using well known and recognised TTY software.

Maintenance & Support

Micro Solution offer an unparalleled support service. Our own team of maintenance engineers are available on 24 hour response and telephone or on-site assistance is available for software queries.

To discover more about the fantastic British Genius contact Bill Whaley or Bede Dunlop.

THE MICRO SOLUTION LTD

The Micro Solution Limited
Park Farm House
Heythrop
Chipping Norton
Oxfordshire OX7 5TW
Tel: Chipping Norton (0608) 3256

● Circle No. 167

99

TROJAN HORSE

by Marise Morland

Atkin picked up the instruction leaflet and, not for the first time, turned to a single paragraph printed in red. "This circuitry is copyright", it stated. "Any attempt to probe, study, or otherwise examine, will cause the toy to harmlessly destruct".

He picked up the doll itself, lying face down on the bed where Tina had left it. Its large, round, blue eyes stared owlishly at him, meeting his troubled gaze with dumb insolence. Maybe the thing could see as well as hear. Yes, there was definitely something disturbing about the Candy doll, and if Tina had not been so attached to it he would have tried taking it apart, despite that admonitory red paragraph.

It had seemed such a good idea at first. For three years he had struggle to bring up Tina alone after his wife had left him — three years with a precocious, demanding, possessive little daughter, and an equally demanding job as project co-ordinator at System Alpha, heart of the Ministry of Defence computer network. Then the advertising material had arrived through the post. A glossy brochure introduced Candy, the cybernetic aid to the natural development of the young.

"The fabulous Candy doll"! it said. "Candy walks! Candy talks! Candy will enthral your daughter and keep her amused for hours.

"This unique creation stands two feet six inches tall, and is powered by an atomic battery. She has real hair which can be styled, plus four different fashion outfits. Candy is the ideal playmate for the intelligent child.

"Let our doll educate, instruct and entertain. Answer the following questions about your child's IQ and environment, and send the reply with the order form. The Candy doll's vocabulary will be individually matched to your child's needs.

"Stocks are limited, so order without delay". The address was a box number at a central London office.

The price was astoundingly low. Atkin had been unable to resist the offer, and a few days later had almost fallen over a large package on the front doorstep. In it was the doll, with its steely eyes and over-large head.

Tina had loved it. She spent hours imparting all manner of childish confidences to the toy, while it replied in its precise, pedantic little speaking voice. Atkin was able, after many a trying day, to relax in peace.

But that had been several weeks ago. Now there was too much silence, too much retreating into the nursery. Tina, the hitherto extrovert six-year-old, had become subdued and sullen. The doll had never responded to Atkin's questions, apart from a peremptory "Give me back to Tina", so he had no idea what his child and the automaton had been discussing.

Atkin's worries were solely centred on his efficiency as a single parent. Having established that Tina was not misbehaving at school, and having been accused of over-reacting, he forced himself into silence. To have done anything else would have been to admit to his inadequacies.

He was determined to cope, despite increasing pressures at work brought about by the mounting international tension. Naturally, he had tried to listen at Tina's door, but Candy's sensitive instrumentation had detected him at once. The doll's cry of "Hello Daddy!" had made him feel faintly ridiculous. The last thing he wanted was to look foolish in the eyes of his own child.

Atkin replaced the doll on the coverlet and quietly left the room. From now on, Tina and Candy would have privacy.

Years of preparation had elapsed before the Candy promotions had been sent out. Atkin and many other defence personnel had been under surveillance for a long time, ever since nuclear submarines had been discarded in favour of a less expensive land-based programme.

Atkin had always been high on the list of priority targets, but the departure of his wife had placed him at its head, for it rendered him vulnerable in a way which ideally suited Candy's creators.

Spies could be relied on to co-operate in small matters such as the updating of pass-codes, but the main objective — it had long been decided — could only be implemented by someone who was totally ignorant of the consequences.

Candy's programming was as complete as possible on delivery, but the doll still received certain updates at irregular intervals, in the form of coded FM transmissions. Daily, it received Tina's undivided attention.

"Again, Candy! I want to hear Mummy again"!

"You heard her yourself, when you were three", Candy said placidly. "You heard why she was leaving Daddy. You were hiding on the stairs".

"Play her again", Tina repeated.

"You were very little when Mummy went away", said Candy in the same even tone. "Too little to understand why. Do you understand now"?

"Play her"! Tina was close to tears.

Finally, Candy obliged. Jean Atkin had rejected her daughter as well as her husband, but any such suggestion had been edited out. What the child heard, issuing tinnily through the doll's speech circuits, was: "I'm going away. Any other man would have seen the danger signs long ago, but not you. Too single-mindedly loyal to System Alpha. For five years I've had to put up with your unscheduled overtime, conferences, system malfunctions and Christ knows what else. Only I haven't been putting up with it, not for the past six months".

Here, Jean had described her lover, but that had prudently been deleted as well. "If you want me to stay", her voice continued, "you will have to change your job. If you are not prepared to make that sacrifice then there is nothing more to be said".

Atkin had remained silent. His injured pride would not allow him to plead.

"That's it, then", said Jean after a moment. "I'm going. Oh, don't look so hurt, darling — you've still got your damned computer. You don't really need me"!

The recording ended. Tina stared expressionlessly at the floor.

"Do you understand why Mummy went"? repeated Candy.

"Course I do", Tina said crossly. "Don't keep on. It was Daddy's job".

"Would she come home if it were not for the job"? asked Candy. "I think she would, don't you"?

"Yes. But Daddy won't give it up. Not ever".

Many miles away, the split-second decision was made. This was the right moment to initiate phase two of the operation.

"Daddy will not resign as long as the computer's working", said Candy after a long pause. "But if it stopped, he would have to stop too! Think how pleased Mummy would be".

"She'd come back to us, said Tina with utter conviction. "But Daddy says the computer never stops".

"I could stop it", said Candy quietly. "I know how. But you will have to take me there".

Tina looked apprehensive. "I don't know the way".

"I'll show you".

"I'm not allowed out on my own", said Tina, twisting her hands together nervously.

"Don't be a baby", said Candy sharply. "You will not be on your own — you'll have me".

Tina stood in front of a large security door which looked uncompromisingly shut. "Hold me up to the voice identification grid", said Candy. "You should just be able to reach it. And remember what I told you on the way here — no talking when I'm talking, or you will spoil everything".

"Yes, Candy", said Tina dutifully. She hefted the doll by its ankles. In a perfect resonant imitation of Atkin's voice, Candy recited: "If music be the food of love, play on". The door rolled back.

"Candy, how did you do that"? Tina squealed.

"Quiet"! snapped Candy. "Do you want to get us caught? Run to the end of this passage, and hurry"!

Tina obeyed, scurrying fearfully along. High up in the walls, far above her head, were transparent panels, from behind which came the sound of movement and chatter. Candy had not told her what to do if she met anyone, and she dared not ask now. The passage remained clear and they reached the security doors leading to the computer room, and once more Tina raised the doll as high as she could.

"Ill met by moonlight", pronounced Candy in Atkin's voice. The doors parted briefly, closing again as soon as Tina had stepped through. Inside, disc and tape drives whirred busily, but no people were in evidence. Beyond the rows of storage units was the unattended executive console.

Tina hesitated, warily hostile, before this array of hardware. "I don't like . . ." she began in a whisper.

"At the other end of the room there is a little TV", said Candy brightly. "Go over to it, and sit me on the chair".

Reassured, the child crossed to the executive console and perched Candy on the swivel chair which faced the VDU. Then she waited, fidgeting.

"Tina", said the doll after another long silence. "I'm not high enough to watch the screen. Find something to put on the chair seat, and sit me on top".

There was something profoundly disturbing about the Candy doll.

Candy had never before mentioned an ability to see, but Tina was too preoccupied to notice anything out of the ordinary. Tiptoeing back into the computer section, she found some surplus disc packs and returned with a pair of them.

"Good girl", said Candy after being repositioned. "I'm going to talk to the computer now, so stay absolutely quiet till I have finished. Do not go near the main doors. Is that clear"?

"Yes Candy". Tina took a couple of paces backwards and stood waiting.

"Shall I compare thee to a summer's day", Candy began, using Atkin's voice. "Request account utility".

The screen began to list options.

"Create new account holder", Candy continued.

"Priority levels one through six. Request voice print".

Bored by this incomprehensible conversation, Tina turned her attention to the rather pretty display of lights on the diagnostic panel.

"The quality of mercy is not strained". Candy's own voice had returned, quoting words from the screen. The new LD was duly listed and acknowledged. Tina moved away and began to pick at a loose piece of wall tiling.

"The quality of mercy is not strained", Candy said again. "General network broadcast. Abort all current tasks. Erase existing account voice prints. Initiate network-test mode. Terminate interactive session."

The screen blanked. Candy then proceeded to give the Shakesperian identities of several key personnel, with voices to match. Each time the VDU responded with the simple statement "account nullified."

Suddenly there was a sharp crack. Little fragments like hailstones spattered briefly against the console as Tina whirled round. Her shriek was followed by a flood of incredulous tears. Her doll had gone.

Seconds later, the sobbing child ran from the computer room. She was met by a throng of people who had been trying to get in. Atkin was among them.

"What on earth . . ." he began, seizing his daughter and shaking her. "Tina! Tina, what are you doing here?"

"We were stopping the computer for Mummy", said Tina when she had calmed down enough to speak. "Candy talked in your voice and a lot of different voices. I put the things on the chair so she could talk to the television, and then she . . . she . . ." Her face crumpled once again.

"There is no possible error", said the general. "Norad confirms that ICBMs have been launched against the United Kingdom".

"Then why don't the fools retaliate"?

"It looks like someone has taken out their defence network, sir. Have we your permission to launch a counter-strike"?

The President, unlike his predecessor, was not a warlike man. He paused only a moment before replying.

"No, Commander you have not".

"But sir," he protested. "The terms of the NATO alliance clearly state . . ."

"I am aware of the terms", snapped the President. "But unless the hostiles are aimed at our own shores, we do not use counter-force. That, gentlemen, is final".

The radar screens were dotted with traces, each heading for a selected target. Technicians worked frantically, trying to countermand Candy's instructions, though, like Atkin, they knew perfectly well there would not be enough time to start a launch.

One blue, glass eyeball, the single recognisable part of the wrecked doll, stared accusingly from the floor. Atkin stood next to his lost, lonely little daughter, who clutched earnestly at his arm.

"I'm sorry, Daddy", she whispered. "Can I make it better, Daddy? Can I"?

Overwhelmed by a chilling sense of failure, Atkin gazed blankly at the screen as the traces moved steadily onward.

A POWERFUL MULTI-USER SYSTEM FOR UNDER £6,600.

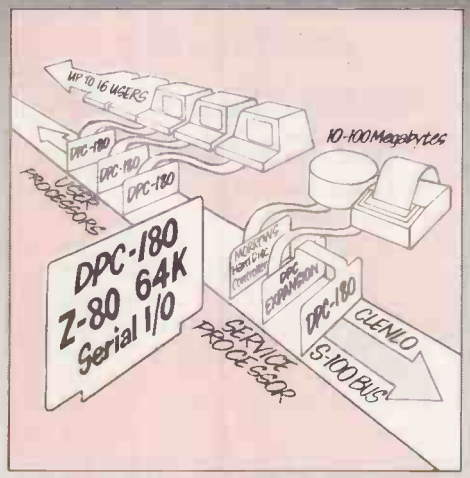
From as little as £5,800.00 (plus VAT) you can enter the world of multi-user distributed processing with the CLENLO ACE MULTI-USER SYSTEM.

The only genuine Micro multi-processor system readily available with the full range of multi-user facilities.

With the CLENLO ACE multi-user system up to sixteen users each have exclusive use of a Z-80A processor and 64K RAM mounted on a S-100 board, each with a serial RS-232 I/O port to which the user's VDU is attached.

The multi-user system is housed in a standard S-100 mainframe chassis enabling individual users to run programs independently and simultaneously, while still having access to shared resources (hard disc storage, printers etc.) – via the S-100 BUS Inter Processor Communication channel.

All this activity is controlled by a DPC/OS multi-user operating system running in a Service Processor and creating a complete CP/M Ver 2.2 environment for each user.



CLENLO
Microcomputers designed for business

The CLENLO ACE multi-user system supports full multi-user facilities...

- ☐ Full lock-out at record level.
- ☐ Facility to designate files – private, group or public.
- ☐ Full 4MHz speed for each user.
- ☐ Fast memory to memory data transfer.
- ☐ Enhanced batch submit facility.
- ☐ Floppy disc storage, or Winchester hard disc storage up to 100 Megabytes.
- ☐ Automatic print spooling and de-spooling.
- ☐ Tape back-up facilities available... backed up by the exceptional CLENLO service and highly competitive prices.

Whether you want a basic two user system incorporating floppy disc storage or the facility of a full sixteen user hard disc based system with high performance, CLENLO can provide the system you need.

For more details of the best, lowest cost multi-user system on the market and our complete range of Microcomputer and business services contact CLENLO COMPUTING SYSTEMS, Telephone 01-670 4202/3.

To: CLENLO COMPUTING SYSTEMS LIMITED, Crown House, 18 Gypsy Hill, London SE19 1NL. Telephone: 01-670 4202/3.

☐ Please send me details of your ACE MULTI-USER SYSTEM.

☐ Please send me details of the complete CLENLO range.

Name _____

Position _____

Company _____

Address _____

_____

Telephone _____

● Circle No. 168

An Atom in exile

For most of us, computing is strictly an indoor occupation, but a fieldwork team from London University recently decided to expose their micro to the rigours of a South Atlantic expedition. Martin Hayman has been finding out how they fared.

ST HELENA is one of the most remote places on Earth. A tiny volcanic island about half the size of the Isle of Wight, it lies just over 2,000 km south of the equator in the South Atlantic. The west coast of Africa is 1,700km away.

As one of the last few Crown colonies in Britain's possession, St Helena is administered by a rearguard of colonials. Its 5,000 inhabitants, despite their provenance from Africa, Asia and South America, share only seven family names and look to England as the centre of their world. Many households sport a picture of the Queen in their living rooms. The first video recorder arrived on the island complete with a recording of the wedding of the Prince and Princess of Wales, and it was almost done to death as the inhabitants clamoured to see the events which had taken place several weeks previously in London.

It was against this background that a recent expedition by a fieldwork group from University College, London introduced the microcomputer. The machine in question was an Acorn Atom with which the deputy leader of the expedition, Tony Nicholson, proposed to undertake statistical analysis of the results of human geography researches into the people of St Helena.

Use and abuse

So small and rugged is the island that there is no airstrip. Transport from the U.K. is strictly by boat, with stops at Tenerife and Ascension Island. The 14,000 km trip on the RMS *St Helena* — the last Royal Mail ship in existence — follows an old spice-trade route and takes three weeks. Once the micro was embarked at Avonmouth, there could be no looking back.

It is a credit to the construction quality and general reliability of the Atom that it performed almost flawlessly throughout the long period of use and abuse of the field trip. The computer was loaded and unloaded from a lighter at St Helena, where the ship moors offshore since there is no proper harbour. It was demonstrated by team members to the ship's crew and passengers, and to the Public Works Department of the island's administration. Perhaps the most severe test of all came when it was hammered by classes of schoolchildren who had never before played, or even seen, Space Invaders. It was even used at sea, on deck, hooked up to the occasional deck power supply which is driven by the ship's generators at a nominal 60Hz.

Mainframe to micro

One of Nicholson's prime objectives was to see how a standard micro would behave in field conditions. Computing is nothing new to geographical and geological studies, and Nicholson had used Leicester University's Cyber CDC as an undergraduate. More recently he worked with University College's GEC minis — which recently replaced an IBM 360 mainframe — and London University's Prime. Despite this mainframe-orientated background he sees the future of computing in geography departments lying with linked micros. Few departments will have sufficient funds, he believes, to replace equipment of this size.

The ship's faltering power supply was a severe test for the micro.

Casting around for a suitable micro for geographical work, he had used both Pet and Sharp machines. He was looking, he says, for a robust, popular and cheap personal computer with good graphics. Acorn Computer became one of many sponsors who contributed, directly or indirectly, to setting up the expedition with its travel arrangements, supplies, equipment and insurance.

The Atom was finally delivered in kit form, one month before the ship was due to sail. In that period Nicholson assembled and tested the computer and wrote the necessary software in Basic, modelling its features on the statistical package implemented on the Prime mini.

The package offers the following facilities:

- Product-moment correlation coefficient and test statistic.
- Simple linear regression and test statistic.
- Analysis of variance (parametric).
- Student's t-test.
- Histogram — asterisks only, as the graphics space is used to store data.
- Mean and standard deviation; subsequently combined under the heading "descriptive statistics".
- Log 10 transformation, with the results of the transformation stored in a user-specified column.
- Autocorrelation.
- List one variable.
- Amend data.
- Save data set on tape.
- Input data set from keyboard or tape.

This formidable list of subroutines has been crammed into rather less than 6K, leaving the other partition, normally used as the graphics area, free for data.

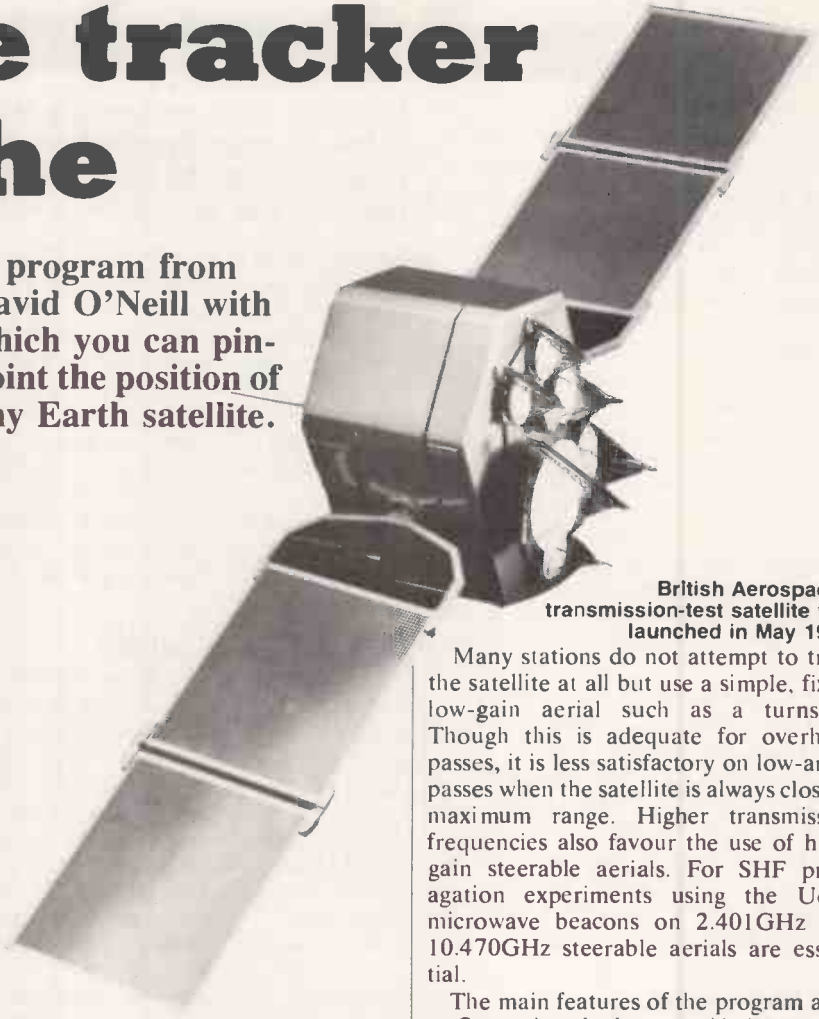
Widespread interest

Data is stored as a series of columns, each representing a different variable. The main constraints are that variables should consist of equal numbers of cases and the data set should not exceed 1,000 items. After a data set has been entered, a prompt is printed to which the user replies with a four-line command to choose the operations required. The bulk of the program is loaded from 2900 hex and consists of a series of subroutines taking approximately 5K. A simple control program, loaded into the graphics area at 8200 hex, dimensions array space and then transfers control to the main program. The data set is thus loaded into the graphics area, optimising available memory space. Nicholson hopes to take advantage of the graphics feature — which he had specifically looked for — in a future map-plotting program.

The principal use of the computer to the expedition was in analysising the answers to 1,000 questionnaires on emigration which had been sent to St Helenites before the expedition set sail. Part of Tony Nicholson's purpose was to promote and popularize the microcomputer, and he succeeded in arousing interest in a number of quarters, including the Secondary Selective School and among island officials.

Satellite tracker scans the skies

A program from David O'Neill with which you can pinpoint the position of any Earth satellite.



British Aerospace's transmission-test satellite was launched in May 1978.

SINCE THE first Oscar satellite was launched in 1961 there has been an ever-increasing interest in the specialised techniques of space communications. The reception of cloud-cover pictures from the American NOAA and Soviet Meteor weather satellites has also proved to be an interesting challenge to many, amateurs and professionals alike. The first British amateur satellite Uosat, launched last year, heralds a new era in amateur satellites. Uosat carries a number of experiments which are designed to allow ground stations to investigate a variety of physical phenomena ranging from microwave propagation to solar particles.

For full use to be made of some of the ionospheric propagation experiments, ground stations must have orbital predictions of the highest possible accuracy.

The most important information required to track a satellite on a particular pass is a series of parameters known as "look angles". These are simply aerial aiming angles which specify the direction of the satellite as viewed by the observer. Look-angles have three elements:

Azimuth, AZ — the bearing, measured in degrees clockwise from north, to the point on the Earth's surface vertically below the satellite known as the sub-satellite point.

Elevation, EL — the vertical angle between the horizon and the satellite measured in the direction of the azimuthal bearing.

The time for which a particular set of AZ-EL data is valid.

The combination of ground-station location, satellite and time results in a unique look angle. Generating a set of look angles calls for extensive calculation using spherical trigonometry, and to simplify this procedure most stations adopt a graphical approach to tracking. This usually involves preparing a chart of true bearings from the station to various points on the Earth's surface, which is a tedious process in itself. Subsidiary charts of elevation and track must then be constructed for each satellite; when used with the true-bearing chart, they yield the look angles for a particular orbit.

Such charts are more than adequate for aerial-aiming. A chart error of 5° might seem large, but it is quite insignificant when used to aim an aerial with a beam width of perhaps 50°.

Many stations do not attempt to track the satellite at all but use a simple, fixed, low-gain aerial such as a turnstile. Though this is adequate for overhead passes, it is less satisfactory on low-angle passes when the satellite is always close to maximum range. Higher transmission frequencies also favour the use of high-gain steerable aerials. For SHF propagation experiments using the Uosat microwave beacons on 2.401GHz and 10.470GHz steerable aerials are essential.

The main features of the program are:

- Generation of reference-orbit data,
- Generation of azimuth and elevation angles.
- Latitude and longitude of the sub-satellite track.
- Slant range of the satellite.
- Accurate rise and set times.
- Time of closest approach.
- Ease of updating changing orbital parameters.
- All times displayed in GMT; hours, minutes and seconds.

With the addition of the necessary hardware, the program can be adapted to automatically track the aerial as the satellite makes a pass.

The program displays time with a resolution of one second, though the accuracy of all calculated values is ultimately dependent on the accuracy of the orbital parameters used in the program. These parameters should be updated as frequently as possible.

All the equations used in the program assume a circular orbit and a spherical earth; satellites with markedly elliptical orbits will produce erroneous data.

When the EQX time (equatorial crossing time) and longitude are input, the program calculates the EQX time and longitude for the next 10 orbits, or more if requested.

After the EQX time and longitude for the orbit of interest, the program requests a start time. This is the period of time

```
45   REM ****** SATELLITE TRACKING  ********
50   REM ****** D O'NEILL - GM8 FRD ********
55   CLEAR 500
75   V$ = "######.        %       %         ###.##"
80   U$ = "%       %      ###.#       ##.##       #######."
85   L1=0.062471 : L2=0.960972
100  CLS : PRINT"WHICH SATELLITE DO YOU REQUIRE?" : PRINT : PRINT
105  PRINT"              1. TIROS-N" : PRINT
110  PRINT"              2. UOSAT" : PRINT : PRINT : PRINT
115  INPUT"ENTER CODE";N : ON N GOTO 150,155
120  CLS : PRINT"WHICH OPTION?" : PRINT : PRINT
125  PRINT"              1. REFERENCE ORBITS" : PRINT
130  PRINT"              2. AZ-EL CALCULATIONS" : PRINT : PRINT
135  INPUT"ENTER CODE";N : ON N GOTO 1200,400
150  P=102.1241 : PH=1 : PM=42 : PS=7.45 : PL=25.53 : I1=1.726352 :
RH=7225 : R=0.881799 : GOTO 120
155  P=98.0 : PH=1 : PM=38 : PS=0 : PL=24.5 : I1=1.701696 : RH=6901 :
R=0.9232 : GOTO 120
400  CLS : INPUT"WHAT IS THE EQX TIME - HHMMSS";XG$
405  XH$=LEFT$(XG$,2) : XH=VAL(XH$)
410  XM$=MID$(XG$,3,2) : XM=VAL(XM$)
```

(Listing continued on next page)

L1	Station longitude
L2	Station latitude
L3	Sub-satellite longitude
L4	Sub-satellite latitude
L5	EQX longitude (degrees west)
C	Quadrant angle
EL	Satellite elevation
I1	Orbit inclination
D	Great-circle angle
P	Period in minutes
PH	Period (hours)
PM	Period (minutes)
PS	Period (seconds)
PL	Longitude increment per orbit
T	Time after EQX (minutes)
AZ	Azimuth
RH	Earth radius + satellite altitude
R	Earth radius ÷ RH
RA	Slant range

Table 1. Program variable list.

between EQX and the first calculation. The next request is for the time interval between calculations.

By way of a demonstration, try the following values for Tiros-N.

EQX time	144630
EQX longitude	345
Start time	0600
Time increment	0200

Six sets of data should be printed out, starting at 14 52 30 and ending at 15 02 30.

The sub-satellite track is not normally required but is available and may be printed out with the AZ-EL data by including L3 and L4 in the relevant Print lines. The direct, line-of-sight distance between the ground station and the satellite, known as the "start range", is printed out in kilometres.

The rise time of the satellite is the time at which it appears on the horizon, i.e., when its elevation is zero. Ionospheric refraction may render the radio beacon audible while the satellite is still below the horizon, and the acquisition-of-signal (AOS) time or the radio-rise timing differ from the true rise time. The beacon may be heard for some time after the satellite has set thus giving a loss-of-signal (LOS) time or radio-set time. To realise the full value of Uosat's propagation experiments the true rise and set times of the satellite must be established as accurately as possible.

To calculate the rise time, the AZ-EL routine is used to obtain a time when the satellite elevation is close to zero but negative. It is then used as the start time for the following run, and the time increment is reduced. By repeating this process a few times, a close approximation to the rise time can be obtained. A subroutine can be incorporated into the program to perform the iterative process of arriving at the rise or set time.

The satellite is closest to the observer when its elevation is at its maximum. The time of closest approach can be found by applying the iterative process.

Orbital parameters are held in lines 150 and 155. The period is held in minutes and also in hours, minutes and seconds as PH, PM, PS. PL is the longitude increment, i.e., the angle by which the Earth rotates between two consecutive equatorial crossings. The inclination of the orbit plane is held in I1.

The values given in line 150 are typical of a Tiros-N spacecraft, and those in line 155 are the expected values for Uosat.

A subroutine enables all times to be displayed in the standard form of HH, MM, SS to permit direct readout of the GMT times for which the calculations are valid. The station longitude, L1 and latitude, L2, are set in line 85. Longitudes east of Greenwich are negative.

Lines 75,80 are the image lines for Print Using statements. For machines without this facility the Print statements must be formatted accordingly.

(Listing continued from previous page)

```
415  XS$=RIGHT$(XG$,2) : XS=VAL(XS$)
420  PRINT : INPUT"WHAT IS THE EQX LONGITUDE - DEGREES WEST";L5
425  PRINT : INPUT"HOW LONG AFTER EQX IS THE START TIME - MMSS";ST$
430  SM$=LEFT$(ST$,2) : SM=VAL(SM$)
435  SS$=RIGHT$(ST$,2) : SS=VAL(SS$)
440  PRINT : INPUT"WHAT IS THE TIME INCREMENT - MMSS";DT$
445  DM$=LEFT$(DT$,2) : DM=VAL(DM$)
450  DS$=RIGHT$(DT$,2) : DS=VAL(DS$)
455  XG$=XH$+" "+XM$+" "+XS$ : CLS
460  PRINT"CALCULATIONS START "SM$" MINS "SS$" SECS AFTER EQX
     AT "XG$" / "L5 : PRINT : PRINT
465  S=0 : M=0 : H=0 : T=SM+SS/60
470  S=XS+SS
475  IF S>=60 THEN S=S-60 : M=M+1 : GOTO475
480  M=XM+SM+M
485  IF M>=60 THEN M=M-60 : H=H+1 : GOTO 485
490  H=XH+SH+H : IF H>=24 THEN H=H-24
495  GOSUB 1300 : GOSUB 1400
500  PRINT" GMT          AZIMUTH     ELEVATION    RANGE" : PRINT
505  PRINT USING U$;G$,AZ*57.29578,EL*57.29578,RA
510  FOR I=1 TO 6
515  S=S+DS : IF S>=60 THEN S=S-60 : M=M+1
520  M=M+DM : IF M>=60 THEN M=M-60 : H=H+1
525  IF H>=24 THEN H=H-24
530  T=T+DM+DS/60 : GOSUB 1300 : GOSUB 1400
535  PRINT USING U$;G$,AZ*57.29578,EL*57.29578,RA : NEXT I
540  PRINT : INPUT"OPTIONS - 1.SAME ORBIT 2.NEW ORBIT 3.NEITHER";N
     CLS
545  ON N GOTO 425,400,100
1199 REM ***** REFERENCE ORBIT ROUTINE *****
1200 SC=0 : S=0 : M=0 : H=0
1205 CLS : INPUT"WHAT IS THE ORBIT NUMBER";N : PRINT : PRINT
1210 INPUT"WHAT IS THE EQX GMT - HHMMSS";XG$
1215 XH$=LEFT$(XG$,2) : H=VAL(XH$)
1220 XM$=MID$(XG$,3,2) : M=VAL(XM$)
1225 XS$=RIGHT$(XG$,2) : S=VAL(XS$) : GOSUB 1400
1230 PRINT : PRINT : INPUT"WHAT IS THE EQX LONGITUDE - DEG WEST";L5
1235 CLS : PRINT"ORBIT NO.        EQX GMT            EQX LONG"
1240 PRINT : PRINT USING V$;N,G$,L5
1245 FOR I=1 TO 10
1250 N=N+1 : L5=L5+PL : IF L5>=360 THEN L5=L5-360
1255 B=S+PS+SC : S=INT(B) : SC=B-S : IF S>=60 THEN S=S-60 : M=M+1
1260 M=M+PM : IF M>=60 THEN M=M-60 : H=H+1
1265 H=H+PH : IF H>=24 THEN H=H-24
1270 GOSUB 1400 : PRINT USING V$;N,G$,L5 : NEXT I
1275 PRINT : PRINT : INPUT"OPTIONS - 1. NEXT 10 ORBITS 2. NEW REF
ORBIT  3.NEITHER";Z : ON Z GOTO1235,1200,55
1299 REM ***** AZ - EL ROUTINE *****
1300 SI=SIN(6.283185#T/P)#SIN(I1)
1305 L4=ATN(SI/SQR(-SI*SI+1))
1310 CO=COS(6.283185#T/P)/COS(L4)
1315 L3=1.570796-ATN(CO/SQR(-CO*CO+1))+(T*0.004363)+(L5*0.0174533)
1320 IF L3>=6.283185 THEN L3=L3-6.283185
1325 IF L3>=0 AND L3<=3.141593 THEN L=L3 : GOTO 1335
1330 L=L3-6.283185
1335 L=L1-L
1340 IF L>3.141593 THEN L=L-6.283185
1345 IF L<-3.141593 THEN L=L+6.283185
1350 X=ATN(COS(L)/TAN(L4))
1355 C=ATN((SIN(X)*TAN(L))/COS(L2+X))
1360 IF L>0 AND C>0 THEN AZ=C
1365 IF L>0 AND C<0 THEN AZ=C+3.141593
1370 IF L<0 AND C>0 THEN AZ=C+3.141593
1375 IF L<0 AND C<0 THEN AZ=C+6.283185
1380 CO=(SIN(L2)*SIN(L4))+(COS(L2)*COS(L4)*COS(L))
1385 D=1.570796-ATN(CO/SQR(-CO*CO+1))
1390 EL=ATN((COS(D)-R)/SIN(D))
1395 RA=RH*SIN(D)/SIN(1.570796+EL) : RETURN
1399 REM ***** GMT ROUTINE *****
1400 IF S<10 THEN S$="0"+RIGHT$(STR$(S),1) ELSE S$=RIGHT$(STR$(S),2)
1405 IF M<10 THEN M$="0"+RIGHT$(STR$(M),1) ELSE M$=RIGHT$(STR$(M),2)
1410 IF H<10 THEN H$="0"+RIGHT$(STR$(H),1) ELSE H$=RIGHT$(STR$(H),2)
1415 G$=H$+" "+M$+" "+S$ : RETURN
```

Karadawn Limited Presents. .

THE KD-INTERLINK

FOR THE FIRST TIME A TRULY MULTI-CONFIGURABLE MICRO AVAILABLE OFF THE SHELF

- ★ 64K Dynamic R.A.M.
- ★ Single board computer. No servicing problems. Replaceable in minutes
- ★ Telecomms Software available for most Mainframes
- ★ System Status Panel continuously displays Terminal Printer and Drives conditions
- ★ 4 mhz. clock speed
- ★ CP/M 2.2 included in price
- ★ Own name labelling available (OEM only)
- ★ Will accept practically any Terminal
- ★ 6 months parts and labour warranty

FOR THE CLIENT

Multiple Drive/Storage Configurations

Because your needs may vary the KD-INTERLINK can vary with them. Up to 4 drives of any mix of 5¼" or 8" (Hard Disk coming soon) can be supplied for development systems, unusual storage needs, special applications etc. Now you can truly design a system for yourself INTERLINKS can start small and grow by the simple addition of extra drives.

Immediate delivery in U.K. and overseas.

Example: End User Price of KD-INTERLINK with D/S D/D Superslim 8" Tandon Drives giving 22.2 meg., Adds Viewpoint Terminal.

Only £3,500.00 + VAT

For further details/demonstration telephone Warrington 573212.

Export enquiries welcomed.

Karadawn Limited
2 Forrest Way
Gatewarth Industrial Estate
Great Sankey
WARRINGTON

DEALERS: Contact us now for details of our dealer support plan.

● **Circle No. 169**

Pulling in the public

For the next generation of buyers, the packaging and charisma of the product will be more important than its technical niceties. Martin Hayman argues that manufacturers who ignore this trend do so at their peril.

IMAGE-MAKING is an under-rehearsed phenomenon in microcomputing. At present this is perhaps a welcome situation, for when one product so closely resembles another — who is to tell the difference between two floppy discs? — the essence of the product is in the features it offers to the user. Amateur computer users generally have a high level of awareness of what they are buying and using, and would feel slighted if anyone were to suggest otherwise. The kind of hype which surrounds the record and audio-cassette industry, you might think, is not for us.

Nevertheless, it will come. As entry-level systems get steadily cheaper, more of the uninitiated will be buying machines which they, at least, will call a "computer". No matter that it might only be capable of running Asteroids, and that the principal input is from a pair of joysticks rather than a keyboard. One of the future selling features of the games computers — which are becoming available in steadily increasing numbers in High Street electrical stores — will be upward compatibility with all sorts of other peripherals including, obviously, a keyboard.

Increasingly, the first sale will be made on availability, support, advertising, packaging, TV slots — perhaps, even, favourable reviews secured from journals like this one. In short, image-making and hype will be to the fore.

There are products which will not require any external boost to their image particularly if there is already sufficient recommendation in the name itself, but these are unlikely to be the High Street entry-level systems which will attract the future mass market for home-computing products. The BBC Micro will be one such, thanks to the august nature and intrinsic respectability of its sponsor. Another, of course, will be IBM's Personal Computer.

Charismatic element

Others will have to offer more before they even start to compete, and will have to shape up their selling techniques accordingly. In some cases an element of personal charisma may help to sell a product which is otherwise only the equal of its competitors.

One example is the Osborne briefcase micro. Doubtless it will soon be joined by other, smaller, faster, more powerful portable micros. But it is likely to remain pre-eminent, not only because it was the first such computer on the scene, but also for the name of its creator, West Coast micro guru Adam Osborne.

Not for nothing do the crack salesmen — even in software — simply ask for the market, the price, the discount structure and the availability, and tell their masters: "Forget the features, just let me get on with the job of selling it". Does IBM send its Hursley research personnel into the field to argue the merits of their systems to the potential customers? It does not.

To return nearer to our field, in which a herd of disconsolate telesoftware sheep are grazing. What about the manufacture of Modems, vital to any process of data communication? There can be no doubt that the Datel 600 Modem, which is supplied to many customers of British Telecom in scores of different configurations, is a solid and robust device. We even have one here at *Practical Computing*. It took

ModTech brings showbiz to telesoftware, using French farce and roller-skaters.

about two months to agree the specification with British Telecom and to get it installed — a process which also involved getting BT approval for the Research Machines 380-Z, but that's another story.

In the meantime the swashbuckling proprietor of Modular Technology, John McNulty, had arranged for us to have one of his smaller, simpler and lighter Modems. It worked, which is more than can be said of the communications software attached to the Research Machines.

McNulty's ModTech operation is an example of the high-profile — some might even say charismatic — approach to selling what is to the customer, little more than a small box. It may be significant that the ModTech Modem is finished in poppy red while the Datel is a staid ironsides grey. Yes, of course everyone knows that BT now sells Mickey Mouse telephones, but look at all the cheap and mouthwatering appliances advertised in the mail-order catalogues.

ModTech's stand at recent Compec exhibitions, for example, has always been noted for its racy presentation. In 1980 there was a bevy of attractive young ladies scooting around on roller skates and last year it featured the concept "Linking the Unlinkable". The stand was divided into two parts, with space-age decor on one wing and an antique Louis l'Hotel scene on the other. On the modern side there was a micro which was communicating with an obsolete teleprinter installed on the French farce side.

The ostensible message was that you can drive anything from anything else with a ModTech Modem. More to the point, it featured some very presentable young women who attracted heavy traffic to the ModTech stand from among the predominantly charcoal-suited gentlemen who attended Compec. Only the Nashua Data Products stand, where they were giving away free vinyl footballs in exchange for your business card, attracted a comparable surge of clients. These, mark you, are business professionals. How much more will the newcomer be swayed by presentation and all the razzmatazz of packaging, presentation and good, old-fashioned hype?

The greyer products

The manufacturers of the greyer micro products would do well to take note of Atari's plans to establish a users' network in Britain. Along with its parent company, Ingersoll, Atari is owned by Warner Brothers — an organisation best known for its interests in film, cable TV and the record industry. An Atari users' club, communicating via the usual U.S. 300/300baud standard, is already in operation in the States and Atari's U.K. outfit has expressed interest in implementing a Prestel-standard communications network. There is even a consultant working on the enhancement.

A Prestel interface for the Atari 400/800 would be a boost for Prestel telesoftware. Regular computer users might not think much of these brightly-packaged machines and their garish games cartridges, but the capability to load new games, or update with new versions of existing games from the telephone line — via Prestel and through the Gateway to Atari's own games database — could prove a strong sales point. Some of the existing features of Atari's network service in the U.S. — which includes news of hardware developments and catalogues of Ingersoll's extensive range of electronic products, plus the possibility of ordering by direct credit-card debit — cannot fail to add to the attractions. In the end, it may be promotion rather than technical features which wins the struggle for the teenager's pocket money.

Assess your talent as a programmer with Michael Smith's Patsy, the Programmer Aptitude Testing System. It makes its choice according to analytical abilities.

Patsy's gift for spotting programming skill

THE MOST DIFFICULT problem in selecting people for training as programmers is ensuring that the trainees will have the necessary blend of abilities to benefit fully from the training course, and to make sure that they will develop, with experience on the job, into competent programmers. This requires an identification of the prerequisite skills, and a test or series of tests which will have the necessary predictive power to indicate which candidates will justify spending money and time to train.

There is considerable evidence that a programmer needs only three fundamental skills. This may startle some readers and infuriate others, but more than 20 years as a programmer in charge of the training and employment of programmers has convinced me of the truth of this assertion. I suggest that the basic skills are as follows:

- Literacy. The ability to read and write reasonably simple English.
- Numeracy. For most applications, certainly in the commercial field, the equivalent of O-level mathematics is quite adequate.
- Logical/analytical ability. The ability to break a problem down into its constituent parts or requirements, and then to build up a solution on a logical basis.

When testing for these abilities, it soon becomes apparent that the situation is not quite so simple. There are perfectly satisfactory methods of testing in the first two areas using "paper and pencil" types of test which have been in use for many years, but you come to the crunch when you start to think about the third requirement — perhaps the most crucial of all the three.

There are "pencil and paper" tests which claim to measure logical ability, for example the type sometimes called Progressive Matrices, or "fill in the next two numbers in the series". I have used a number of tests of this type, and though solving them requires an element of logical ability I feel they suffer from a number of drawbacks.

The most serious shortcoming is that the recommended procedure is usually to sit the candidate down at a table, give him the test paper and instructions, start the clock and leave him to it. At the end of the stipulated period his paper is removed and marked and you are, perhaps, convinced that you have tested something. However, many people have become very familiar with this type of test, and there is evidence that familiarity increases speed in completing these tests. A more serious criticism is that they provide no idea just how the candidate hit on the solutions even of those problems which were completed correctly. In other words, there is no test of the most vital factor — the analytical ability of the candidate. To test for it, the examiner needs to be able somehow to observe the mental processes brought to bear on the problem, or at least the nature of the steps which the candidate takes to solve it.

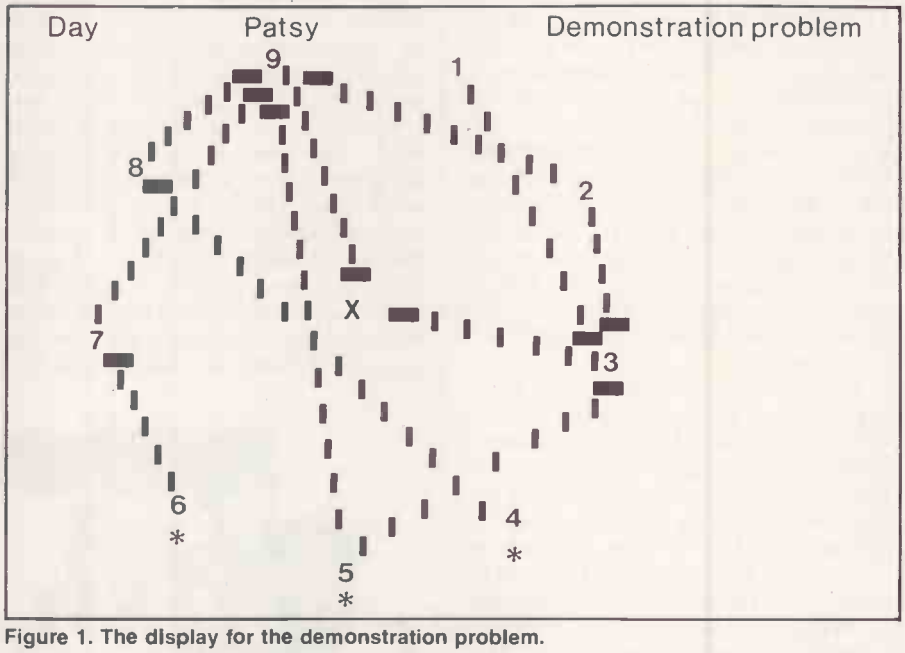


Figure 1. The display for the demonstration problem.

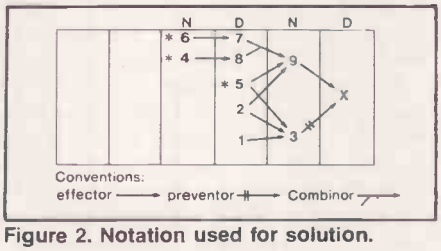


Figure 2. Notation used for solution.

Patsy — Programmer Aptitude Testing System — presents the candidate with a set of 10 problems. It includes a demonstration problem which the examiner works through in the course of his explanation, and four grades of increasingly complex problems. There are alternative problems at each level of complexity, which can help to eliminate collusion between successive candidates.

When the program is run, a menu of the 10 problems is displayed first. After a selection from the menu is made, the screen displays the numbers 1 to 9 arranged in a circle, with a letter X in the centre of the circle and a number of lines running across the circle from one number to another and to the central X. In the top left corner of the screen, the word "Day" appears. After an interval of some three seconds this alternates with the word "Night" in the same position. This alternation of day and night continues throughout the solution of each problem — see figure 1. The number of the problem being worked on is also displayed.

When a number key is pressed on the keyboard, a lighted graphics block or "light" appears on the screen next to the corresponding number, and remains on until the end of the time period during which it was switched on. At the start of the next period, the "light" goes out, and if a line on the screen connects that number to some other, or the centre, then the light for the latter number may be turned on, depending on a relationship which the line represents.

Solving the problem is very much a matter of discovering the relationships that exist within the problem. The principal rules of the problem are typed on a card which is available to the candidate throughout the testing session.

The program is written for a TRS-80 in level II Basic and fits into 16K. The rather crude representation of an arrow — rule 5 — is necessary because of the low-resolution graphics on the TRS-80. On a

machine with higher resolution graphics, you can undoubtedly provide a more elegant display.

Converting the program to other micros should be straightforward, except for the routine which detects single or coincident key depressions, lines 3010 to 3050. On the TRS-80, RAM location 14352 contains a power of two from 2^1 to 2^7 whenever a number key from 1 to 7 is pressed, or the addition of the corresponding powers if a combination of keys is pressed. Similarly, location 14368 contains 2^0 when an 8 is pressed and 2^1 for a 9.

The routine in question sorts out what has been pressed and turns the lights on accordingly. Your micro no doubt does things differently, and if you cannot see how to produce a routine which does the same thing, you probably have the Inkey$ function which you can make use of instead. You may have to introduce into the rules a prohibition on simultaneous key depressions.

If you want to change the problem set-ups which I give — although they are good ones — lines 10000, 10100, 10200, etc., give the start of each set-up. Array T determines whether lights are day or night workers in any one problem — 1 for day, 2 for night. Lines 10n20 to 10n50 give the logical relations for day workers, and lines 10n60 to 10n80 give those for night workers, using Boolean operators And and Not; n in the line number is the problem number as per the menu. The Data lines 20 to 350 are used to set screen points for the relationship lines and are those appropriate for the TRS-80 screen format of 128 by 48 points. These lines are, unfortunately, tedious to key in and will in any case need to be changed for different screen formats.

The procedure is, if anything, more important than the program. It is vital to have uniformity of testing conditions and procedure, and at the start of testing the candidate should always be provided with paper for notes, pencil and eraser. Any candidates who have never sat in front of a micro keyboard before should be allowed to spend a little time familiarising themselves with the keys, although only keys 1 to 9 will be used.

The examiner then runs the program and selects the demonstration problem, 0 on the menu. The examiner should work through this, first showing how an effector relation from light 9 turns on the centre block while a preventor from light 3 stops this from happening. All the other relations in this problem are simple effectors and can be demonstrated as such, except for a combinor from lights 7 and 8 which turns on light 9. Thus all the possible types of relation between the various lights can be demonstrated. A solution involving only keys 4, 5 and 6 should then be shown.

The answer to the demonstration problem is to press 4 and 6 during the night period. Any questions which arise should be answered by the examiner, who should ensure at this stage that the candidate has a good understanding of what is involved.

When all is clear, press Enter to return to the menu. On the TRS-80, Clear can be used at any time to turn off all lights on the display. Problem 1A should then be selected and the candidate told to start. There is no specific time limit for each problem, but I have found the following limits for each level:

level 1: 10 minutes
level 2: 15 minutes
level 3: 17 minutes
level 4: 20 minutes

A candidate who is clearly nowhere near a solution after these times should be told to abandon the problem. The relations involved in that problem are then explained and the solution demonstrated. An alternative problem at the same level is then presented. A candidate's session finishes if the second problem is not solved. After a candidate has solved a problem at one level, the test should be taken to the next level.

When the candidate has successfully solved a problem at level 2, a system of notation is introduced to him, equivalent to a form of flow-charting. It is explained that its use is optional, but that it may help to solve succeeding problems.

An example of the notation is shown in figure 2, which represents the demonstration problem. The vertical lines represent time periods, and a sensible use of the notation would be first to put an X in the

(continued on page 111)

Table 1. An outline of the grading scheme used.

Grade	Recommendation	Problem levels solved: 1	2	3	4	4 with MO	Remarks
A	HR	*	*	*	*	*	16 minutes, 20 operations on MO
A−	HR/R	*	*	*	*	*	
B+	R	*	*	*	*	*	
B	MR/R	*	*	*	*	X	
B−	MR/NR	*	*	*	*		
C+	MR/NR	*	*	*	X		
C	NR	*	*	*			
C−	NR	*	*	*			
D+	NR	*	*	X			
D	NR	*	*				
D−	NR	*	X				
E+	NR	*					
E	NR	X					

Key: HR: Highly recommended
R: Recommended
MR: Marginally recommended
NR: Not recommended
*: Problem solved at this level
X: Partial solution due to excessive time or less than total understanding
MO: Minimum operations

Summary of Principal Rules

The problem is solved when you manage to turn on the centre light three times in succession using only keys 4, 5 and 6. These are marked with an asterisk on the screen to remind you of their importance. The "best" solution will be one derived from full understanding of the logical relations involved. You may be asked to explain your solution.

1. Time is derived into two periods called "day" and "night".
2. Every light is active in only one or other of the time periods.
3. The number keys do nothing except turn on their respective lights. Hold the key down. If the light does not come on after a fraction of a second, wait until the time changes and press the key again.
4. There are three kinds of relation between lights:
   - Effector — this turns on the light the line points to.
   - Combinor — this works only in combination with another light.
   - Preventor — this prevents a light from being turned on.
5. Each line indicates the existence of one relation. The small block permanently shown at one end of the line can be thought of as an arrow-head showing the direction of the line. If there is no line between two lights, neither one affects the other.
6. The relation takes effect in and only in the following time interval. After a light has gone out, it has no effect until turned on again. All relationships exist between lights; it makes no difference whether the light was turned on by pressing a key or as a result of a relation between lights.
7. Within a time interval the order of key depressions makes no difference. Keys may be pressed one at a time or simultaneously.
8. You may press any number keys or any combination at any time. You may combine asterisked keys and non-asterisked, you may press an asterisked key and follow up with a non-asterisked key or vice versa.
9. You may "back up" or start again at any time. That is, if you have tried an unsuccessful asterisk key combination, you may switch to non-asterisk key operations to get more information.
10. You may study the problem diagram on the screen as long as you wish. You may take notes. You may refer to this sheet. You may ask questions to clarify the rules.
11. Every problem is solvable. There are no "tricks" or "secrets" or ambiguous rules.

THE SHARP MZ-80K HAS GOT IT ALL

STOP PRESS... NOW AVAILABLE
BASIC COMPILER
PASCAL (CASSETTE BASED)
DOUBLE PRECISION DISC BASIC
FDOS INCLUDES EDITOR AND Z-80 ASSEMBLER

Since its introduction the Sharp MZ-80K has proved to be one of the most successful and versatile microcomputer systems around.

Sharp now have a comprehensive range of products ready to make the powerful MZ-80K with its Printer and Disc Drives even more adaptable.

Products include:- Universal Interface Card, Machine Language and Z-80 Assembler packages, CP/M* plus a comprehensive range of software.

You'll find all the help and advice you need about the MZ-80K at your Specialist Sharp Dealer in the list below.

*Trade mark of Digital Research Ltd.

If there is no dealer in your area, or if you require any further information write to:- Computer Division, Sharp Electronics (UK) Ltd., Sharp House, Thorp Road, Newton Heath, Manchester M10 9BE.

SHARP
First, and foremost

AVON
BCG Computer Systems Ltd., Bristol. Tel: 0272 425338
Decimal Business M/Cs Ltd., Bristol. Tel: 0272 294591
Target Electronics, Bristol. Tel: 0272 421196
BERKSHIRE
Computer 100, Bray. Tel: 0628 35619
Newbear Computing Store Ltd., Newbury. Tel: 0635 30505
BIRMINGHAM
Camden Electronics, Small Heath. Tel: 021 773 8240
Electronic Business Systems Ltd., Birmingham. Tel: 021 384 2513
Jax Rest Ltd., Birmingham. Tel: 021 350 4555
Newbear Computing Store Ltd., Birmingham B26. Tel: 021 707 7170
BUCKINGHAMSHIRE
Curry's Microsystems, High Wycombe. Tel: 0494 40262
Interface Components Ltd., Amersham. Tel: 02403 22307
CAMBRIDGE
The Avery Computing Co Ltd., Bar Hill. Tel: 0954 80991
CHESHIRE
Bellard Electronics Ltd., Chester. Tel: 0244 380123
Charlesworth of Crewe Ltd., Crewe. Tel: 0270 56342
Chandos Products, New Mills. Tel: New Mills 44344
CR Technical Services, Chester. Tel: 0244 317549
Fletcher Worthington Ltd., Hale. Tel: 061 928 8928

Holdene Limited, Wilmslow. Tel: 0625 529586
Newbear Computing Store Ltd., Stockport. Tel: 061 491 2290
Ors Group Ltd., Warrington. Tel: 0925 67411
Sumlock Software, Warrington. Tel: 0925 574593
CLEVELAND
Hunting Computer Services Ltd., Stockton-on-Tees. Tel: 0642 769709
Intex Datalog Ltd., Stockton-on-Tees. Tel: 0642 781193
DERBYSHIRE
Malison Electronics Ltd., Derby. Tel: 0332 38066
DEVON
Plymouth Computers, Plymouth. Tel: 0752 23042
DURHAM
Neecos (DP) Ltd., Darlington. Tel: 0325 69540
ESSEX
Prorole Ltd., Westcliff-on-Sea. Tel: 0702 335298
Wilding Office Equipment, Ilford. Tel: 01 514 1525
GLOUCESTERSHIRE
Gloucestershire Shop Equipment Ltd., Gloucester. Tel: 0452 36012
The Computer Shack, Cheltenham. Tel: 0242 584343
HAMPSHIRE
Advanced Business Concepts, New Milton. Tel: 0425 618181
Xitan Systems Ltd., Southampton. Tel: 0703 387401
HEREFORD
Market Logic Ltd., Little Dewchurch. Tel: 0432 70279

HUMBERSIDE
Commercial Systems Ltd., Hull. Tel: 0482 20022
Silicon Chip Centre, Grimsby. Tel: 0472 45353
KENT
Technolink Europa Ltd., Tunbridge Wells. Tel: 0892 32116
Video Services (Bromley) Ltd., Bromley. Tel: 01 460 8833
LANCASHIRE
Nelson Computer Services, Rawtenstall. Tel: 0706 229125
Sumita Electronics Ltd., Preston. Tel: 0772 51686
LEICESTERSHIRE
Gilbert Computers, Lubenham. Tel: 0858 65894
G.W. Cowling Ltd., Leicester. Tel: 0533 553232
Leicester Computing Centre, Leicester. Tel: 0533 556268
Mays Hi-Fi, Leicester. Tel: 0533 22212
LINCOLNSHIRE
Howes Elect & Autom. Servs., Lincoln. Tel: 0522 32379
Z.R. Business Consultants, Lincoln. Tel: 0522 31621
LONDON
Bridgewater Accounting, Whetstone. Tel: 01 446 0320
Butel-Comco Ltd., Hendon. Tel: 01 202 0262
Central Calculators Ltd., London EC2. Tel: 01 729 5588
Deans, London W8. Tel: 01 937 7896
Digital Design and Development, London W1. Tel: 01 387 7388
Euro-Calc Ltd., London EC2. Tel: 01 729 4555

Henry's Radio Ltd., London W2. Tel: 01 402 6822
Lion Computing Shops Ltd., London W1. Tel: 01 637 1601
Scope Ltd., London EC2. Tel: 01 729 3035
Sumlock Bondain Ltd., London EC1. Tel: 01 253 2447
MANCHESTER
The Byte Shop, Manchester M1. Tel: 061 236 4737
Electrovalue, Manchester. Tel: 061 432 4945
Sumlock Electronic Services Ltd., Manchester M3. Tel: 061 834 4233
MERSEYSIDE
Microdigital Ltd., Liverpool. Tel: 051 227 2535
NORFOLK
Sumlock Bondain (East Anglia) Norwich. Tel: 0603 26259
NORTHAMPTONSHIRE
Computer Supermarket, Corby. Tel: 05366 62571
HB Computers, Kettering. Tel: 0536 520910
NORTHERN IRELAND
Bromac (UK), Co. Antrim. Tel: 023831 3394
O & M Systems, Belfast. Tel: 0232 49440
NOTTINGHAMSHIRE
Almarc Business Systems Ltd., Nottingham. Tel: 0602 62251
Mansfield Business M/C Ltd., Mansfield. Tel: 0623 26610
OXFORDSHIRE
Oxford Computer Centre, Oxford. Tel: 0865 45172
REPUBLIC OF IRELAND
O'Connor Computers Ltd., Galway. Tel: 0009 61173

Sharptext, Dublin 2. Tel: 0001 764511
Tomorrows World Ltd., Dublin 2. Tel: 0001 776861
SCOTLAND
A & G Knight, Aberdeen. Tel: 0224 630526
Business and Electronics M/Cs, Edinburgh. Tel: 031 226 5454.
Micro Centre, Edinburgh. Tel: 031 556 7354
Micro Change, Glasgow. Tel: 041 554 1462
Microforth, Dunfermline. Tel: 0383 32071
Moray Instruments Ltd., Elgin. Tel: 0343 3747
Pointer Business Equipment Ltd., Glasgow. Tel: 041 332 3621
SOMERSET
Norset Office Supplies Ltd., Cheddar. Tel: 0934 742184
SUFFOLK
C.J.R. Microtek Co. Ltd., Ipswich. Tel: 0473 50152
SURREY
3D Computers, Surbiton. Tel: 01 337 4317
Croydon Micro, Carshalton. Tel: 01 643 4290
Datalect, Croydon. Tel: 01 680 3581
Datalect, Woking. Tel: 04862 25995
Microlines Ltd., Kingston. Tel: 01 546 9944
R.M.B. Ltd., Croydon. Tel: 01 684 1134
Saradan Electronic Services, Wallington. Tel: 01 669 9483

SUSSEX
Crown Business Centre, Eastbourne. Tel: 0323 639983
Gamer, Brighton. Tel: 0273 698424
M & H Office Equipment Brighton. Tel: 0273 697231
WALES
Limrose Electronics Ltd., Wrexham. Tel: 097 883 5555
Morriston Computer Centre, Swansea. Tel: 0792 795817
Sigma Systems Ltd., Cardiff. Tel: 0222 21515
Welsh Computer Centre, Bridgend. Tel: 0656 58481
WARWICKSHIRE
Business & Leisure Microcomputers, Kenilworth. Tel: 0926 512127
WILTSHIRE
Everyman Computers, Westbury. Tel: 0373 823764
YORKSHIRE
Bits & P.C.'s Wetherby. Tel: 0937 63744
Datron Micro-Centre Ltd., Sheffield. Tel: 0742 585490
Huddersfield Computer Centre, Huddersfield. Tel: 0484 20774
Leeds Computer Centre, Leeds. Tel: 0532 458877
Omega Systems Ltd., Leeds. Tel: 0532 704499
Ram Computer Services Ltd., Bradford. Tel: 0274 391166
Superior Systems Ltd., Sheffield. Tel: 0742 755005

Also at selected Lasky's and Wildings Office Equipment Branches

● Circle No. 170

Patsy Performance Report

Mr/s *O.* referred by

was examined by *M. Smith* on *23/12/80* from *1.55* to *3.05*

Instructions used: Standard *X* Other *Minimum operations on problem 4B*

Sequence of problems	*1A*	*2A*	*3A*	*4A*	*4B*
Solved (S) Not solved (N)	*S*	*S*	*S*	*S*	*S*
Minutes worked	*4.0*	*7.9*	*6.4*	*7.0*	*6.3*
Total operations	*13*	*34*	*21*	*22*	*10*

Quality Rating for Total Performance: *A*

Examiner Checker

Analytical Characteristics Exhibited: Very little Some Much *X*

X Consistently Analytical *on problems 4A and 4B*

X Primarily Analytical *on problems 1A, 2A and 3A*

Sporadically Analytical

Adopts analytical methods when other approaches fail

Initially analytical but abandons the method

Little evidence of analytical ability

Comments on performance: *Ms O. demonstrates a concise, analytical attack over all problems. Her understanding of problem logic was accurate and thorough except for one relation on 2A and one on 3A. Her descriptions became more analytic and better organised with each succeeding problem.*

Recommendation: *Ms O. is highly recommended for computer programmer training.*

Patsy Performance Report

Mr/s *S.* referred by

was examined by *J. Buchanan* on *22/7/81* from *2.00* to *3.45*

Instructions used: Standard *X* Other

Sequence of problems	*1A*	*1B*	*2A*	*3A*	*3B*
Solved (S) Not solved (N)	*N*	*S*	*S*	*N*	*S*
Minutes worked	*10.5*	*6.1*	*15.4*	*21.4*	*7.7*
Total operations	*44*	*10*	*46*	*91*	*35*

Quality Rating for Total Performance: C—

Examiner Checker

Analytical Characteristics Exhibited: Very little Some *X* Much

Consistently analytical

X Primarily analytical *(but very redundant) on problem 3A*

X Sporadically analytical *on problem 3B*

Adopts analytical methods when other approaches fail

Initially analytical but abandons the method

X Little evidence of analytical ability *on problems 1A, 1B and 2A*

Comments on performance: *Mr S. attempted to solve the first three problems with the exclusive use of asterisk keys. His solutions to 1B and 2A appear to have been arrived at by chance. His descriptions of these problems were entirely in terms of the display phenomena with little reference to the exact nature of the relationships. He then used highly redundant analysis on 3A, but did not solve the problem because he failed to investigate one key relationship.*

Recommendation: *Mr S. is not recommended for computer programmer training.*

Figure 3. Two typical performance reports, one for a pass candidate and one for a fail.

(continued from page 109)

right-hand division, representing the target centre block, then entering in the division to the left of those numbers which have lines leading to the centre, and so on. As the relations in the problem are investigated and identified, they can be coded on the diagram, using the conventions shown. The examiner should observe whether the notation, once introduced, is used effectively in subsequent problems.

If problem 4A is successfully solved, the candidate should finally be set problem 4B. The candidate is instructed to make the maximum use of logic in order to minimise the number of operations, an operation being all activity — pressing one key or several — which takes place within one time period.

Different grades are allocated to what appears to be identical performance in the various levels of problem since performance on a particular problem is assessed on its logical and analytical content. A problem may be solved, but with varying evidence of these qualities. The following terminology is used:

Analytical. Refers primarily to method, the breakdown of actions into their component parts.

Logical. Refers primarily to the correctness of the description of the solution.

For example, given 6 — 8 — 9, the following might be found:

Logical and analytical: 9 is lit by 8 which is lit by 6

Analytical but not logical: 9 is lit by 8 which is lit by 2

Logical but not analytical: 6 eventually causes 9 to light

Figure 3 shows two typical performance reports produced from a testing session, one for a pass candidate and one for a fail. The examiner's assessment is very much a result of observing the candidate during the test itself. Judgements can then be made on the candidate's approach to problems involving increasingly complex logical relationships, and the level of analytical ability brought to the solution. This is the exceptionally powerful aspect of this testing method, which I have not found to be equalled by any of the others I have used over the years.

The testing procedure is greatly enhanced by the use of a system containing a line printer. Routines could be added to the program which will

- Print a time marker on a separate line for each time period,
- Record all key depressions taking place within one time period,
- Print a marker every time the display is clear, i.e., all lights go out.

It should be quite simple to implement, and will then provide a permanent printed record of exactly what the candidate did at any given moment while progressing towards a solution. Such a record frees the examiner from the need to observe the candidate's actions, comments, etc.

If your system has a real-time clock, it could be used to terminate each problem, and it should not be difficult to devise a form of automatic scoring.

```
1 REM ** PROGRAMMER APTITUDE TESTING SYSTEM **
2 REM ** COPYRIGHT (C) 1981 BY MICHAEL SMITH **
10 REM ** THE DATA LINES FOLLOWING CONTAIN THE SETTING
          POINTS FOR THE RELATIONSHIP LINES FOR ALL THE
          PROBLEMS. THESE ARE THOSE APPROPRIATE FOR A
          SCREEN LAYOUT OF 128 X 48 POINTS.          **
20 DATA 84,10,87,12,90,14,93,16,96,18,99,20,102,22,104,24,105,24,106,24,100,16,95,15,85,13,80,12,75,11,70,10,65,9,60,8,54,7,55,7,56,7,109,18,109,20,109,22,108,24,1
09,24,110,24,106,26,102,26,98,26,94,26,90,26,86,26,82,26,78,26,74,26,68,26,69,26
30 DATA 70,26,94,38,87,36,80,34,73,32,66,30,59,28,52,26,45,24,38,22,31,20,23,18,24,18,25,18,75,40,81,38,87,36,93,34,99,32,104,30,105,30,106,30,67,40,65,37,63,34,61
,31,57,25,55,22,53,19,51,16,49,13,46,10,47,10,48,10,35,38,32,36,29,34,26,32
40 DATA  22,30,23,30,24,30,25,26,28,23,34,17,37,14,40,11,41,9,42,9,43,9,22,13,25,12,28,11,31,10,34,9,37,8,39,7,40,7,41,7,50,9,52,11,54,13,56,15,58,17,60,19,62,21,6
2,22,63,22,64,22,79,9,76,11,73,13,70,15,67,17,64,19,61,21,60,23,61,23,62,23
50 DATA 103,15,99,16,95,17,91,18,87,19,83,20,79,21,75,22,71,23,66,24,67,24,68,24,104,26,100,26,96,26,92,26,88,26,84,26,80,26,76,26,72,26,66,26,67,26,68,26,89,38,86
,37,83,36,79,35,76,34,73,33,70,32,67,31,64,30,61,29,58,28,55,27,52,26,49,25
60 DATA 46,24,43,23,40,22,37,21,34,20,31,19,28,18,24,17,25,17,26,17,94,38,91,36,88,34,85,32,82,30,79,28,74,25,73,24,68,21,62,17,59,15,56,13,53,11,49,9,50,9,51,9,69
,40,73,38,77,36,81,34,89,30,93,28,99,24,102,22,105,20,107,18,108,18,109,18
70 DATA 68,42,73,40,78,38,93,32,98,30,102,28,103,28,104,28,37,39,40,38,43,37,46,36,49,35,52,34,55,33,58,32,61,31,67,29,70,28,73,27,79,25,82,24,85,23,88,22,91,21,94
,20,97,19,100,18,101,17,102,17,103,17,20,30,25,28,30,26,35,24,45,20,50,18,55,16
80 DATA 64,13,69,11,73,9,74,9,75,9,20,19,20,21,20,23,19,25,20,25,21,25,41,9,39,11,37,13,35,15,33,17,29,21,27,23,25,25,22,27,23,27,24,27,71,8,64,9,57,10,50,11,43,12
,36,13,29,14,24,15,25,15,26,15,102,14,99,13,96,12,93,11,90,10,86,9,87,9,88,9
90 DATA 105,26,101,26,97,26,93,26,89,26,85,26,81,26,77,26,73,26,67,26,68,26,69,26,97,37,99,35,101,33,103,31,105,30,106,30,107,30,68,40,71,38,74,36,77,34,80,32,83,3
0,86,28,92,24,95,22,98,20,100,18,101,18,102,18,64,39,63,37,62,35,61,33,60,31,59,29
100 DATA 58,27,57,25,56,23,55,21,54,19,53,17,52,15,51,13,48,9,49,9,50,9,38,39,44,38,50,37,56,36,68,34,74,33,86,31,92,30,98,29,102,28,103,28,104,28,33,38,31,36,29,3
4,27,32,25,30,22,28,23,28,24,28,21,25,25,25,29,25,33,25,37,25,41,25,45,25,49,25
110 DATA 53,25,59,25,60,25,61,25,26,17,34,18,41,19,48,20,62,22,65,23,66,23,67,23,50,6,54,6,58,6,62,6,66,6,70,6,74,6,75,6,76,6,76,9,74,11,72,13,70,15,68,17,66,19,64
,21,61,23,62,23,63,23,97,15,92,14,87,13,69,10,64,9,59,8,53,7,54,7,55,7
120 DATA 102,29,96,28,90,27,84,26,78,25,72,24,66,23,67,23,68,23,95,37,94,35,93,33,92,31,91,29,89,25,88,23,87,21,86,19,85,17,84,15,83,13,82,11,82,10,83,10,84,10,90,
39,87,38,84,37,81,36,78,35,75,34,72,33,65,31,62,30,59,29,56,28,53,27
```

(continued on page 113)

ITT 2020

48 K Disk Based Computer System

WITH COLOUR GRAPHICS & T.V. MODULATOR FOR T.V. DISPLAY

- DISK DRIVE WITH CONTROLLER INTERFACE
- 48K + 12K FLOATING POINT BASIC
- APPLEWRITER WORD PROCESSING SOFTWARE PROGRAMME
- ALL NECESSARY LEADS AND MANUALS PROVIDED
- 12 MONTH WARRANTY (IN HOUSE SERVICE)

EXCLUSIVE LIMITED OFFER FROM Lion Micro Computers £699 + VAT

SYSTEM SPECIFICATIONS: ITT 2020 Microcomputer: Standard ASCII Keyboard displaying 24 lines x 40 Characters in upper case: optional lower case display available. 6502 CPU, 48K Bytes RAM and 12K fast floating point Palsoft Basic in ROM. Both high resolution (360 x 192) and low resolution colour graphics, ports for up to seven peripherals and paddle ports as standard. Manufactured in Britain under licence from Apple – largely compatible with Apple hardware and software (contact Lion for advice – this is NOT an Apple). ITT Disk Drive. 116K Capacity, random or sequential file access, 35 Track soft sectored disks – Apple DOS 3.2 (contact Lion for advice on other operating systems). Field Maintenance contracts for all equipment are available.

EXPANDABLE & VERSATILE	PRICES EX. VAT.
Second Disk Drive	£200.00
Lower-case screen (fitted)	£50.00
Visicalc 3.2	£75.00
Silentype printer	£207.00
Centronics 737	£425.00
Olympia RO Scripta	£836.00
12" Green Monitor	£119.00
Printer interface	£90.00
Database	£75.00
Vinyl Carrycase	£17.00
Cleaning Kit	£30.00
10 x Disks in case	£25.30
2000 sheets paper	£15.00
OTHER ACCESSORIES	POA
OTHER PERIPHERALS	POA
CP/M For 2020	£250.00

OVER £1200 VALUE FOR £699 + VAT

Lion Micro Computers

Lion House,
227 Tottenham Court Road, London W1P 0HX
Telephone: 01-580 7383 & 01-636 9613
Telex: 28394 Lion G

CRA COMPUTER RETAILERS ASSOCIATION

VISA AMERICAN EXPRESS

● Circle No. 171

(continued from page 111)

```
130 DATA 50,26,47,25,44,24,41,23,38,22,35,21,32,20,29,19,24,18,25,18,26,18,38,38,41,37,44,36,47,35,50,34,53,33,56,32,59,31,65,29,68,28,71,27,74,26,81,24,84,23,90,2
0,93,19,96,18,97,18,98,18,65,39,66,37,67,35,68,33,69,31,70,29,73,22,74,20
140 DATA 75,18,76,16,77,14,78,12,78,10,79,10,80,10,30,38,28,36,26,34,24,32,20,30,21,30,22,30,20,25,23,23,26,21,32,17,35,15,38,13,41,11,43,9,44,9,45,9,28,16,36,18,4
0,19,44,20,48,21,52,22,56,23,58,24,59,24,60,24,52,9,55,10,58,11,61,12
150 DATA 64,13,67,14,73,16,78,18,81,19,84,20,90,22,93,23,96,24,99,25,102,26,103,26,104,26,87,9,90,10,93,11,96,12,99,13,102,14,103,14,104,14,101,16,97,17,93,18,89,1
9,85,20,81,21,77,22,73,23,67,24,68,24,69,24,107,26,107,24,107,22,107,20,106,18,107,18
160 DATA 108,18,95,38,97,36,99,34,101,32,103,30,102,29,103,29,104,29,88,40,83,39,78,38,73,37,68,36,63,35,58,34,53,33,48,32,43,31,38,30,33,29,26,28,27,28,28,28,64,4
0,60,38,56,36,52,34,44,30,40,28,36,26,32,24,28,22,24,20,19,18,20,18,21,18,36,40
170 DATA 39,38,42,36,45,34,51,30,54,28,57,26,58,24,59,24,60,24,22,26,25,24,31,20,34,18,37,16,40,14,43,12,45,10,46,10,47,10,29,14,36,13,51,11,57,10,64,9,71,8,75,7,7
6,7,77,7,49,9,53,13,55,15,57,17,59,19,61,21,62,23,63,23,64,23
180 DATA 79,9,77,11,75,13,73,15,71,17,69,19,67,21,65,23,66,23,67,23,108,18,108,20,108,22,108,24,107,26,108,26,109,26,104,28,102,26,100,24,98,22,96,20,94,18,92,16,9
0,14,88,12,85,10,86,10,87,10,96,36,97,33,98,30,99,27,101,21,101,18,102,18
190 DATA 103,18,64,41,64,39,64,37,64,35,64,33,64,31,64,29,63,27,64,27,65,27,33,38,32,36,31,34,30,32,29,30,28,28,27,26,26,24,25,22,24,20,22,18,23,18,24,18,34,36,35,
34,36,32,37,30,38,28,39,26,40,24,41,22,42,20,43,18,44,16,45,14,46,12,46,10,47,10
200 DATA 48,10,22,29,33,27,45,25,52,24,57,23,58,23,59,23,24,15,31,14,38,13,54,11,62,10,70,9,75,8,76,8,77,8,44,9,41,11,34,16,31,18,28,20,22,24,18,26,19,26,20,26,76,
6,74,8,72,10,70,12,68,14,66,16,64,18,62,20,59,22,60,22,61,22
210 DATA 98,16,93,17,88,18,83,19,78,20,73,21,68,22,65,23,66,23,67,23,102,26,100,24,98,22,95,20,91,15,90,13,88,11,85,9,86,9,87,9,90,41,86,40,82,39,78,38,74,37,70,36
,66,35,61,34,56,33,51,32,46,31,41,30,36,29,29,28,30,28,31,28,96,38,92,37,88,36
220 DATA 84,35,80,34,76,33,72,32,68,31,64,30,59,28,55,27,51,26,47,25,43,24,39,23,35,22,31,21,27,20,23,19,18,18,19,18,20,18,64,39,65,37,67,33,69,29,70,27,71,25,72,2
3,74,19,75,17,76,15,77,13,78,11,78,9,79,9,80,9,66,38,68,37,72,35,74,34,78,32
230 DATA 80,31,82,30,84,29,86,28,88,27,90,26,92,25,94,24,96,23,100,21,102,20,104,19,106,18,107,18,108,18,31,37,33,35,34,33,35,31,37,27,38,25,40,21,41,19,42,17,43,1
5,44,13,45,11,45,9,46,9,47,9,34,37,36,36,38,35,40,34,42,33,44,32,48,30,50,29
240 DATA 53,28,57,26,58,25,59,25,60,25,25,27,28,27,31,27,34,27,40,27,43,27,46,27,49,27,52,27,58,27,61,27,64,27,67,27,73,27,76,27,79,27,82,27,85,27,91,27,94,27,97,2
7,98,27,99,27,26,14,29,13,32,12,35,11,38,10,41,9,42,9,43,9
250 DATA 54,7,60,8,66,9,84,12,96,14,97,14,98,14,78,9,76,11,74,13,72,15,70,17,67,20,65,22,63,23,64,23,65,23,102,15,96,16,89,17,82,18,75,19,61,21,54,22,47,23,40,24,3
3,25,24,26,25,26,26,26,103,26,98,26,93,26,88,26,83,26,78,26,74,26,70,26,66,26,67,26,68,26
260 DATA 92,38,91,35,90,32,89,29,87,23,86,20,85,17,84,14,83,11,81,9,82,9,83,9,99,36,103,34,107,32,110,30,111,30,112,30,60,40,57,39,54,38,51,37,48,36,45,35,42,34,39
,33,36,32,33,31,30,30,27,29,23,28,24,28,25,28,63,41,63,39,63,37,63,35,63,33,63,31
270 DATA 63,29,62,27,63,27,64,27,39,39,42,38,45,37,51,35,54,34,57,33,60,32,66,30,69,29,72,28,75,27,81,25,84,24,90,22,93,21,96,20,99,19,101,18,102,18,103,18,33,38,3
4,36,35,34,37,30,38,28,39,26,41,22,42,20,43,18,44,16,45,14,46,12,47,10,46,9,47,9
280 DATA 48,9,19,26,22,25,25,24,28,23,31,22,34,21,37,20,40,19,46,17,49,16,52,15,55,14,58,13,61,12,64,11,67,10,70,9,73,8,74,7,75,7,76,7,25,14,32,15,39,16,53,18,60,1
9,74,21,80,22,93,24,99,25,100,25,101,25,40,7,37,8,34,9,31,10,28,11,25,12,26,12,27,12
290 DATA 75,10,74,12,72,15,70,18,68,21,65,22,66,22,67,22,74,8,68,9,62,10,56,11,50,12,44,13,38,14,32,15,25,16,26,16,27,16,98,16,94,17,90,18,86,19,82,20,78,21,74,22,
70,23,66,24,67,24,68,24,105,25,101,25,97,25,93,25,89,25,85,25,81,25,77,25,73,25
300 DATA 70,25,71,25,72,25,95,37,94,35,93,33,92,31,91,29,90,27,88,23,87,21,85,17,84,15,83,13,82,11,80,9,81,9,82,9,68,41,72,40,75,39,78,38,81,37,84,36,87,35,90,34,9
6,32,99,31,102,30,103,29,104,29,105,29,60,41,53,39,46,37,39,35,32,33,25,31,19,30
310 DATA 20,30,21,30,33,36,31,30,30,27,29,24,28,21,25,18,26,18,27,18,22,25,25,23,31,19,34,17,41,12,44,10,45,9,46,9,47,9,24,15,28,15,36,15,40,15,44,15,48,15,52,15,5
6,15,60,15,64,15,68,15,76,15,80,15,88,15,92,15,94,15,95,15,96,15
320 DATA 51,6,55,6,59,6,63,6,67,6,71,6,72,6,73,6,56,7,62,8,88,12,94,13,99,14,100,14,101,14,79,10,77,12,75,14,73,16,71,18,69,20,67,22,65,23,66,23,67,23,102,13,99,12
,96,11,93,10,90,9,87,8,88,8,89,8,106,25,106,23,106,21,106,19,105,18,106,18,107,18
330 DATA 102,25,98,25,94,25,90,25,86,25,82,25,78,25,75,25,71,25,67,25,68,25,69,25,90,37,84,35,78,33,71,31,64,29,57,27,50,25,43,23,36,21,29,19,25,18,26,18,27,18,88,
35,84,32,80,29,79,28,76,26,72,23,70,22,65,18,62,16,60,14,58,12,54,10,51,8,50,7,51,7,52,7
340 DATA 66,41,69,39,72,37,75,35,81,31,84,29,87,27,93,23,96,21,99,19,100,17,101,17,102,17,24,29,28,29,32,29,36,29,40,29,44,29,48,29,52,29,56,29,60,29,68,29,72,29,7
6,29,88,29,92,29,96,29,100,29,102,29,103,29,104,29,22,27,26,25,30,23,41,19,46,17
350 DATA 51,15,56,13,61,11,67,9,70,7,71,7,72,7,37,40,42,39,48,38,54,37,60,36,66,35,72,34,90,31,95,30,96,30,97,30,26,16,31,17,36,18,46,20,51,21,56,22,59,23,60,23,61
,23,41,7,39,9,37,11,35,13,33,15,27,21,25,23,22,25,23,25,24,25
1000 DEFINTA-B,D-Z
1010 B$=STRING$(2,143):C$=STRING$(2,128)
1020 A(0)=543:A(1)=167:A(2)=372:A(3)=629:A(4)=878:A(5)=927:A(6)=848:A(7)=585:A(8)=330:A(9)=151 ' PRINT POSITIONS
1030 REM ** MENU OF PROBLEMS **
1040 CLS:PRINTCHR$(23):PRINT"TO SELECT       PRESS

DEMO PROBLEM      0
PROBLEM 1A        1
PROBLEM 1B        2
PROBLEM 1C        3
PROBLEM 2A        4
PROBLEM 2B        5
PROBLEM 3A        6
PROBLEM 3B        7
PROBLEM 4A        8
PROBLEM 4B        9"
1050 PRINT"
PLEASE SELECT OPTION";
1060 I$="":I$=INKEY$:IFI$=""THEN 1060  ELSEP=ASC(I$)-48
1070 IFP<0ORP>9THEN 1060  ELSEGOSUB 6010  :ONP+1GOSUB 10000 , 10100 , 10200 , 10300 , 10400 , 10500 , 10600 , 10700 , 10800 , 10900 ' SET UP PROBLEM
2000 REM ** MAIN DAY AND NIGHT TIMING LOOP **
2010 TI=1:PRINT@0,"DAY  ";:GOSUB 4010  :ONP+1GOSUB 10060 , 10160 , 10260 , 10360 , 10460 , 10560 , 10660 , 10760 , 10860 , 10960 :GOSUB 5010  :FORT=1TO7:GOSUB 3010
  :NEXT
2020 TI=2:PRINT@0,"NIGHT";:GOSUB 4010  :ONP+1GOSUB 10020 , 10120 , 10220 , 10320 , 10420 , 10520 , 10620 , 10720 , 10820 , 10920 :GOSUB 5010  :FORT=1TO7:GOSUB 3010
  :NEXT:GOTO 2010
3000 REM ** KEYBOARD DECODING ROUTINE **
3010 IFPEEK(14400)=1THEN 1040  ELSEIFPEEK(14400)=2THENGOSUB 4010  :FORI=1TO9:B(I)=0:NEXT ' LOCATION 14400 CONTAINS 1 WHEN ENTER                                IS PRESS
ED, 2 WHEN CLEAR IS PRESSED.
                              ENTER TAKES YOU BACK TO THE MENU,
3020 B=PEEK(14352)+PEEK(14368)*256 'CLEAR TURNS OUT ALL LIGHTS                                   ON THE DISPLAY.
  [   THIS LINE CODES NUMERIC KEYS (SEE TEXT)
3030 FORI=0TO9:C=B/2:B=INT(C):IFC-B>0ANDT(I)=TITHENB(I)=1:PRINT@A(I),B$;
3040 NEXT
3050 RETURN
4000 REM ** CLEAR THE DISPLAY **
4010 FORI=1TO9:PRINT@A(I),C$;:NEXT:PRINT@A(0),"X ";:RETURN
5000 REM ** SCAN RELATIONSHIP RESULTS **
5010 FORK=1TO9:IFC(K)=0THENB(K)=0ELSEB(K)=1
5020 C(K)=0:NEXT:RETURN
6000 REM ** DRAW THE BOARD **
6010 CLS:PRINT@28,"P A T S Y";:PRINT@92,STRING$(9,131);:PRINT@149,"9";:PRINT@170,"1";:PRINT@328,"8";:PRINT@375,"2";:PRINT@543,"X";:PRINT@583,"7";:PRINT@632,"3";:PR
INT@846,"6";:PRINT@910,"*";:PRINT@881,"4";:PRINT@945,"*";:PRINT@925,"5";:PRINT@989,"*";:RETURN
7000 REM ** DRAW THE LINES **
7010 RETURN
10000 REM ** SET UP PROBLEM 0 (DEMO) **
10010 T(1)=1:T(2)=1:T(3)=2:T(4)=2:T(5)=1:T(6)=2:T(7)=1:T(8)=1:T(9)=2:RESTORE:FORI=1TO106:READX,Y:SET(X,Y):NEXT:PRINT@45,"DEMO PROBLEM";:RETURN
10015 REM ** ESTABLISH RELATIONSHIPS **
10020 IFB(1)PRINT@A(3),B$;:C(3)=1
10030 IFB(2)PRINT@A(9),B$;:PRINT@A(3),B$;:C(3)=1:C(9)=1
10040 IFB(5)PRINT@A(3),B$;:PRINT@A(9),B$;:C(3)=1:C(9)=1
10050 IFB(7)ANDB(8)PRINT@A(9),B$;:C(9)=1:RETURNELSERETURN
10060 IFNOTB(3)ANDB(9)PRINT@A(0),B$;
10070 IFB(4)PRINT@A(8),B$;:C(8)=1
10080 IFB(6)PRINT@A(7),B$;:C(7)=1:RETURNELSERETURN
10100 REM ** SET UP PROBLEM 1 (1A) **
10110 T(1)=2:T(2)=2:T(3)=2:T(4)=1:T(5)=1:T(6)=1:T(7)=1:T(8)=2:T(9)=2:POKE16639,196:POKE16640,70:FORI=1TO146:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 1A";:RETURN
LOCATIONS 16639 & 16640 CONTAIN A POINTER TO LAST DATA ITEM READ.THIS LINE RESETS IT !
10120 IFB(4)PRINT@A(8),B$;:PRINT@A(9),B$;:C(8)=1:C(9)=1
10130 IFB(5)PRINT@A(2),B$;:PRINT@A(3),B$;:C(2)=1:C(3)=1
10140 IFB(6)PRINT@A(2),B$;:C(2)=1
10150 IFB(7)PRINT@A(1),B$;:C(1)=1:RETURNELSERETURN
10160 IFB(1)ANDB(2)ANDNOTB(3)PRINT@A(0),B$;
10170 IFB(8)ANDB(9)PRINT@A(7),B$;:C(7)=1:RETURNELSERETURN
10200 REM ** SET UP PROBLEM 2 (1B) **
10210 T(1)=1:T(2)=2:T(3)=2:T(4)=1:T(5)=1:T(6)=1:T(7)=2:T(8)=2:T(9)=2:POKE16639,79:POKE16640,74:FORI=1TO116:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 1B";:RETURN
10220 IFB(1)PRINT@A(8),B$;:C(8)=1
10230 IFB(4)PRINT@A(3),B$;:C(3)=1
10240 IFB(5)PRINT@A(2),B$;:PRINT@A(9),B$;:C(2)=1:C(9)=1
10250 IFB(6)PRINT@A(3),B$;:PRINT@A(7),B$;:C(3)=1:C(7)=1:RETURNELSERETURN
10260 IFB(2)ANDB(9)PRINT@A(1),B$;:C(1)=1
```

(continued on next page)

(continued from previous page)

```
10270 IFB(3)ANDB(8)ANDNOTB(7)PRINT@A(0),BS;:RETURNELSERETURN
10300 REM ** SET UP PROBLEM 3 (1C) **
10310 T(1)=2:T(2)=2:T(3)=2:T(4)=1:T(5)=1:T(6)=1:T(7)=2:T(8)=2:T(9)=1:POKE16639,22:POKE16640,77:FORI=1TO145:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 1C";:RETURN
10320 IFB(4)PRINT@A(1),BS;:PRINT@A(8),BS;:C(1)=1:C(8)=1
10330 IFB(5)PRINT@A(1),BS;:C(1)=1
10340 IFB(6)PRINT@A(2),BS;:PRINT@A(7),BS;:C(2)=1:C(7)=1
10350 IFB(9)PRINT@A(3),BS;:C(3)=1:RETURNELSERETURN
10360 IFB(1)ANDB(3)ANDNOTB(8)PRINT@A(0),BS;
10370 IFB(2)ANDB(7)PRINT@A(9),BS;:C(9)=1:RETURNELSERETURN
10400 REM ** SET UP PROBLEM 4 (2A) **
10410 T(1)=1:T(2)=2:T(3)=1:T(4)=2:T(5)=1:T(6)=2:T(7)=1:T(8)=2:T(9)=2:POKE16639,142:POKE16640,80:FORI=1TO100:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 2A";:RETURN
10420 IFNOTB(1)ANDB(3)PRINT@A(2),BS;:C(2)=1
10430 IFB(5)PRINT@A(8),BS;:C(8)=1
10440 IFB(7)PRINT@A(9),BS;:C(9)=1:RETURNELSERETURN
10460 IFNOTB(2)ANDB(6)ANDB(9)PRINT@A(0),BS;
10470 IFB(4)PRINT@A(3),BS;:PRINT@A(7),BS;:C(3)=1:C(7)=1
10480 IFB(8)PRINT@A(1),BS;:C(1)=1:RETURNELSERETURN
10500 REM ** SET UP PROBLEM 5 (2B) **
10510 T(1)=2:T(2)=2:T(3)=1:T(4)=1:T(5)=2:T(6)=2:T(7)=2:T(8)=1:T(9)=1:POKE16639,251:POKE16640,82:FORI=1TO101:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 2B";:RETURN
10520 IFB(4)PRINT@A(2),BS;:C(2)=1
10530 IFB(9)PRINT@A(7),BS;:C(7)=1
10540 IFB(8)ANDNOTB(3)PRINT@A(1),BS;:C(1)=1:RETURNELSERETURN
10560 IFB(5)ANDB(7)ANDNOTB(1)PRINT@A(0),BS;
10570 IFB(2)PRINT@A(3),BS;:C(3)=1
10580 IFB(6)PRINT@A(8),BS;:PRINT@A(9),BS;:C(8)=1:C(9)=1:RETURNELSERETURN
10600 REM ** SET UP PROBLEM 6 (3A) **
10610 T(1)=2:T(2)=2:T(3)=1:T(4)=1:T(5)=1:T(6)=2:T(7)=2:T(8)=2:T(9)=1:POKE16639,115:POKE16640,85:FORI=1TO170:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 3A";:RETURN
10620 IFB(3)ANDB(5)PRINT@A(1),BS;:C(1)=1
10630 IFB(4)PRINT@A(7),BS;:PRINT@A(8),BS;:C(7)=1:C(8)=1
10640 IFB(5)ANDNOTB(9)PRINT@A(2),BS;:C(2)=1:RETURNELSERETURN
10660 IFB(1)ANDB(6)ANDNOTB(2)PRINT@A(0),BS;
10670 IFB(6)ANDB(8)PRINT@A(9),BS;:C(9)=1
10680 IFB(7)PRINT@A(3),BS;:C(3)=1:RETURNELSERETURN
10700 REM ** SET UP PROBLEM 7 (3B) **
10710 T(1)=2:T(2)=2:T(3)=2:T(4)=1:T(5)=2:T(6)=1:T(7)=1:T(8)=1:T(9)=2:POKE16639,132:POKE16640,89:FORI=1TO153:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 3B";:RETURN
10720 IFB(4)ANDB(8)PRINT@A(3),BS;:C(3)=1
10730 IFB(4)ANDNOTB(7)PRINT@A(1),BS;:C(1)=1
10740 IFB(6)PRINT@A(2),BS;:PRINT@A(9),BS;:C(2)=1:C(9)=1:RETURNELSERETURN
10760 IFB(3)ANDB(5)ANDNOTB(1)PRINT@A(0),BS;
10770 IFB(2)ANDB(5)PRINT@A(7),BS;:C(7)=1
10780 IFB(9)PRINT@A(8),BS;:C(8)=1:RETURNELSERETURN
10800 REM ** SET UP PROBLEM 8 (4A) **
10810 T(1)=2:T(2)=2:T(3)=2:T(4)=1:T(5)=1:T(6)=2:T(7)=2:T(8)=1:T(9)=1:POKE16639,41:POKE16640,93:FORI=1TO130:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 4A";:RETURN
10820 IFB(4)ANDB(9)PRINT@A(1),BS;:C(1)=1
10830 IFB(5)PRINT@A(3),BS;:PRINT@A(7),BS;:C(3)=1:C(7)=1
10840 IFB(9)ANDNOTB(8)PRINT@A(2),BS;:C(2)=1:RETURNELSERETURN
10860 IFB(1)ANDB(3)ANDNOTB(2)PRINT@A(0),BS;
10870 IFB(1)ANDB(6)PRINT@A(8),BS;:C(8)=1
10880 IFB(7)PRINT@A(9),BS;:C(9)=1:RETURNELSERETURN
10900 REM ** SET UP PROBLEM 9 (3B) **
10910 T(1)=2:T(2)=1:T(3)=2:T(4)=1:T(5)=2:T(6)=1:T(7)=1:T(8)=2:T(9)=2:POKE16639,67:POKE16640,96:FORI=1TO141:READX,Y:SET(X,Y):NEXT:PRINT@45,"PROBLEM 4B";:RETURN
10920 IFNOTB(2)ANDB(7)PRINT@A(1),BS;:C(1)=1
10930 IFB(4)PRINT@A(8),BS;:PRINT@A(9),BS;:C(8)=1:C(9)=1
10940 IFB(6)ANDB(7)PRINT@A(3),BS;:C(3)=1:RETURNELSERETURN
10960 IFNOTB(1)ANDB(3)ANDB(8)PRINT@A(0),BS;
10970 IFB(3)ANDB(5)PRINT@A(2),BS;:C(2)=1
10980 IFB(9)PRINT@A(7),BS;:C(7)=1:RETURNELSERETURN
```


Electronic Brokers Ltd

VDU & PRINTER OFFERS

HAZELTINE H2000 VISUAL DISPLAY UNIT

27 x 74 Display, 64 ASCII, RS232, full half duplex and full editing XY cursor addressing and batch mode, green phosphor CRT, detachable keyboard.

SPECIAL QUANTITY DISCOUNT OFFER

1-2 **£298.00** 5-9 **£255.00**
3-4 **£275.00** 10+ **£250.00**

AJ832 DAISY WHEEL PRINTER / PLOTTER

Scoop purchase of Anderson-Jacobson AJ832 Daisy Wheel Printers complete with full keyboard integral stand and RS232 interface

1-4 **£995.00** 5-9 **£950.00**
10+ **£895.00**

DEC LA35/LA36 and LA180 MATRIX PRINTERS

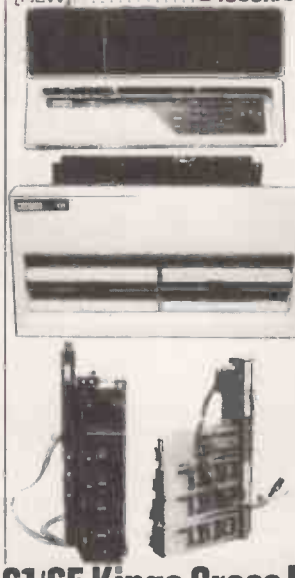
LA36 30cps keyboard printer with integral stand, 132 column tractor-feed, upper/lower case ASCII
LA36 with 20mA interface **£450.00**
LA36 with RS232 interface **£485.00**
LA35 — Receive only version of LA36 — AMAZING VALUE: LA35 with 20mA interface **£250.00**
LA35 with RS232 interface **£275.00**
LA180 high-speed output printer with 180 cps printing, 132 column tractor-feed, upper lower case ASCII. Integral stand [NEW] LA180 printer standard parallel [Centronics type] interface **£495.00**
LA180-ED with optional RS232 or 20mA interface **£670.00**

DEC SALE

a selection from our huge stocks

PROCESSORS

11/03 LJ 5¼in 32KB MOS [NEW] **£1500.00**



11/04 10½in, 32KB MOS .. **£3625.00**
11/35 32KW Core, 6ft cab . **£2750.00**
11/35 96KW Core, KT11D, 6ft Cab **£5000.00**
11/45 32KW Core, 4ft Cab . **£5950.00**
11/45 96KW Core, 4ft Cab . **£7450.00**
11/70 64KW Core, 2 Cabs, LA36 ..... **£18000.00**
11/70 512KB MOS, 2 Cabs, VT100 ..... **£30000.00**
8A-205-BR 32KW MOS **£1750.00**

FLOPPY DISK DRIVES

SPECIAL PURCHASE — BRAND NEW SURPLUS

RX11 BD Dual Floppy & Ctl **£995.00**
RX211 BD Dual Floppy & Ctl . **£1450.00**
RXV11 BD Dual Floppy & Ctl .. **£995.00**
RX8E Dual Floppy & Ctl **£995.00**

OPTIONS

BA11 FE Expander Box **£995.00**
DB11 A/B Unibus Repeater **£525.00**
OD11 A/B Backplane **£125.00**
OJ11 AA Multiplexor [NEW]. . **£1250.00**
DL11 W Asynchronous interface **£395.00**
DR11 W DMA Interface [NEW] **£625.00**
FP11 E Floating Point [11/60] **£1975.00**
KE11 A Extended Arithmetic .. **£625.00**
KE11 B Extended Arithmetic .. **£595.00**
KT11 D Memory Management **£750.00**
M7258 Printer Interface **£325.00**
M9301 Bootstrap module **£325.00**
M9312 Bootstrap module **£395.00**

Electronic Brokers Ltd., 61/65 Kings Cross Road, London WC1X 9LN. Tel: 01-278 3461. Telex 298694

All items reconditioned unless otherwise stated
ADD 15% VAT TO ALL PRICES
Carriage and Packing extra

● Circle No. 173 ▶

THOUGHT PROCESS

Commodore

Apple

Data General

FTS Future Technology Systems

COMMODORE

APPLE

DATA GENERAL

FUTURE TECHNOLOGY SYSTEMS

Gate Microsystems have thought it out for you first.

A range of small computers to cover every conceivable practical application.

Star names that are all star performers:

COMMODORE, the popular multi-function professional.

APPLE, the most versatile of micro-computers.

Superb interactive single and multi-terminal business data processing systems from DATA GENERAL.

The powerful Series 88 from FUTURE TECHNOLOGY SYSTEMS, combining high performance with advanced distributed processor architecture.

From this comprehensive armoury our experts can cover your every hardware and software requirement, off the shelf or tailor-made, with full training facilities and a prompt, caring after-sales service. Word processing to payroll, stock control to statistics, invoicing to information analysis . . in a host of different contexts—we've given ourselves the complete range of options first.

Now we present them all to you.

GATE MICROSYSTEMS LTD

The Nethergate Centre, 35 Yeaman Shore, DUNDEE DD1 4BU. Tel: 0382 28194.
Abbey House, Bothwell Street, GLASGOW. Tel: 041-221 9372.

Systems art draws patterns to order

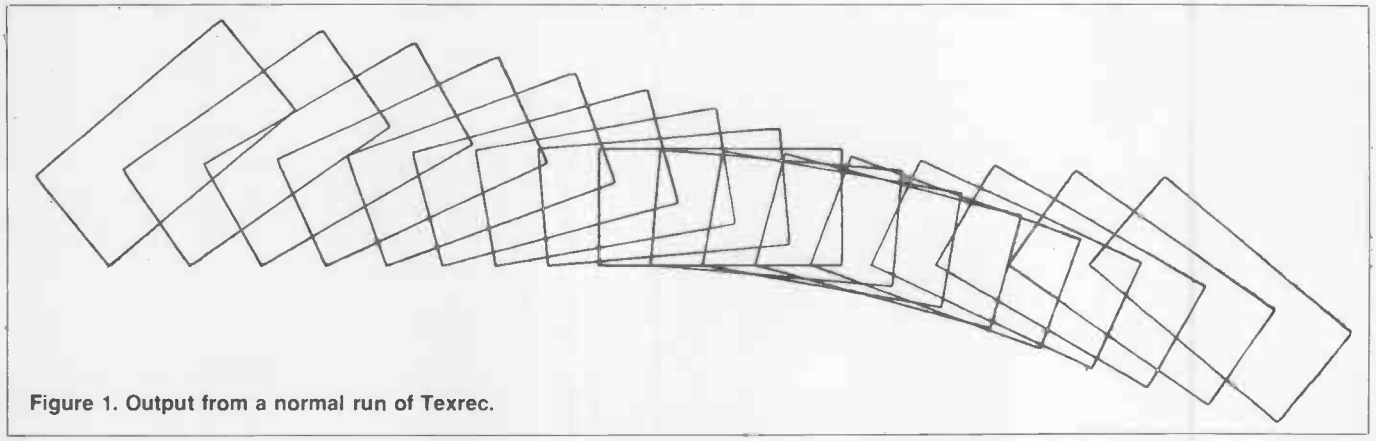


Figure 1. Output from a normal run of Texrec.

THE ROYAL COLLEGE OF ART has departments dealing with textiles and tapestry, as well as an advanced textile-research unit. Students from these areas are amongst the keenest users of our computing facilities. They do not just concern themselves with ordinary fabrics: fibreglass, feathers, leaves, paper and metal mesh have all been incorporated into more usual woven or knitted materials.

Sally Freshwater makes quite beautiful "tapestries" from paper. She took a sheet of plain paper and drew a horizontal pencil line across it, about half-way up. Then, from a point along the bottom edge of the paper, she fanned out lines at regular angles to meet the higher line, at points along its whole length.

She stuck small rectangles of translucent paper along the higher line with their corners each touching the line and one side lying parallel to the contructed "fan" line. The effect of these overlapping rectangles was much more interesting than it sounds, but it took her hours to try out one design.

We wrote the Texrec program to simulate the process on a screen or plotter. Each plot takes about two minutes to draw out on the Calcomp 81 plotter.

The listing of Texrec is written in Basic for the Research Machines 380-Z, with high-resolution graphics. It should run on any machine capable of drawing lines, such as the DAI, Atom, Apple, BBC Micro, etc.

It provides an example of one particular use of computer graphics: the repetition of some action — in this case, drawing the rectangle — with one or more controlling factors or parameters changing slightly each time. Here the parameters are position and angle.

The results can often be "counter-intuitive" — they turn out to be more interesting than you imagined just from thinking about the process. A whole branch of art — called systems art — concerns itself with such phenomena. With some notable exceptions, it tends to lead to a rather sterile and perhaps ultimately boring result, but it can be very useful as a design aid, and is always fun the first few times you try it.

Figure 2. Detail from large rectangle.

The results of two runs are shown here. Figure 1 is a normal run, and should be self-explanatory. Figure 2 used a massive rectangle, and windowed in on just part of the process. On screen, you should try adapting the program to produce a different shape, not merely a rectangle. If you know how, you might try ellipses or polygons, or introduce a random wobble.

If you don't yet know how to produce ellipses, polygons and so on, read these pages in the coming months. Watch out for "instant", curved, three-dimensional graphics.

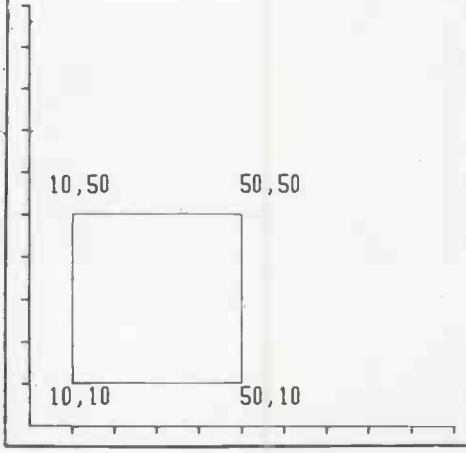
Texrec.

```
100 CLEAR100
110 CALL"RESOLUTION",0,2
120 REM sets up hi-res graphics on 380Z
130 INPUT"COLOUR <1-3>";CS
140 INPUT"HEIGHT OF LINE ABOVE POINT";H
150 REM e.g. 100
160 INPUT"LENGTH & BREADTH OF RECTANGLE";L,B
170 REM e.g. 50,50  or 90,-100 etc.
180 INPUT "RANGE OF ANGLES <e.g.45,-45>";AL,AR
190 INPUT"STEP <e.g. 1 or 5 or 10 etc.>";S
200 INPUT"OK <Y/N>";Z$:IF Z$<>"Y"THEN130
210 PUT12:REM - CLEAR SCREEN
220 FOR A=AL TO AR STEP -S
230 F=3.142/180
240 X(1)=130-H*TAN(A*F)
250 Y(1)=H
260 X(2)=X(1)+(L*COS(A*F))
270 Y(2)=Y(1)+(L*SIN(A*F))
280 X(4)=X(1)+(B*COS((90+A)*F))
290 Y(4)=Y(1)+(B*SIN((90+A)*F))
300 X(3)=X(4)+(X(2)-X(1))
310 Y(3)=Y(4)+(Y(2)-Y(1))
320 FORI=1TO4:X(I)=INT(X(I)):Y(I)=INT(Y(I))
330 REM CONNECT UP
340 CALL"PLOT",X(1),Y(1),CS
350 FORI=2TO4
360 CALL"LINE",X(I),Y(I)
370 NEXT I
380 CALL"LINE",X(1),Y(1)
390 NEXT A
400 INPUT"MORE <Y/N>";ZM$:IF ZM$="Y"THEN130ELSE END
```

BEGINNING GRA
Back to

WE SHOWED last month, in the simplest way possible, how a computer can store or display an image by using a symbolic representation. Now we will show how this technique can offer powerful ways of handling changes to images.

A small square seems to be a simple-enough shape from a computer-graphics point of view. How is it stored in the computer? Typically, a point that is to be at one end of a straight line is represented by a pair of numbers giving the position of the point in a flat space, Two numbers are



ANALOGY BOX

A bug is an error you do not want. We hereby christen the "pug" — the creative mistake, which actually helps you. Do you have any good pugs?

So what's new?

COMPUTER USERS could be forgiven for believing that we are cursed for ever with the present kinds of graphic input and output device, that they are somehow natural or inevitable. Must we really limit ourselves to addressing 50-year-old television technology via keyboards deriving, for heaven's sake, from 19th-century typewriters? We seem to have conned ourselves into believing that it is pleasant to sit for hours, with our face a few inches away from a TV screen, and that it is satisfying to type in endless numbers to produce an image.

Some new devices are beginning to appear that will radically alter our attitudes to communicating with computer hardware. So far they are only available in limited quantities, but they will soon be cheap and common enough to influence much of what we do.

Digitisers — devices for entering drawings, etc. into the computer — are at last coming cheaper, and that is a start. You can already by touch-sensitive displays in a variety of technologies, which allow you to use your finger to draw or point directly on to the TV screen.

The finest versions are pressure-sensitive as well as touch-sensitive. You can use them to "squidge" a shape, distorting or compressing it, for instance. Or you might turn your finger into a blue paintbrush, an italic nib or a flashing cursor. We have used one from the United States, but are also considering other, cheaper ways of controlling everything from the finger tip. Strain-gauges, ultrasonics and stress-sensitive conducting foam are possibilities which have come to mind. Some people in America have even used short-range radar to produce gesture-sensitive displays.

Flat display screens will soon emerge in general use as TV screens and will do away with the flickery, probably dangerous, cathode-ray tube. Little thicker than a newspaper they, above all, are making people wake up to the emerging information environment. They will be built into desk-tops, cars, telephones and, of course, personal computers.

Competition

YOUR TASK for this month arises from the graphics manipulations described on this page. One way to approach similar problems is in reverse, by asking: What has to be done to these co-ordinates to produce such-and-such a transformation?

Submit a Basic program which enables a simple shape, such as a rectangle, to be rotated in two dimensions, by any angle, about any point on the screen. The £5 prize will go to the author of the shortest working routine; high marks will be awarded for tricks and "fudges" which make the routine simpler or quicker. Keep your program as general as possible so that it can be used, with the minimum of adaption, on any machine.

Send your entry to "Art", *Practical Computing*, Room L306, Quadrant House, Sutton, Surrey SM2 5AS.

One final note — do not worry too much about the mathematics and trigonometry you use. You can try referring to an old school maths textbook, or confound your old maths teacher and use first principles.

PHICS

front and upside down

The shapes on your monitor screen are defined by a few numbers held in memory. Brian Reffin Smith explains how to apply some simple arithmetic so that you can alter those shapes at will.

required because you are dealing with a two-dimensional shape. The fact that there will be lines connecting pairs of these points need not be stored — a standard program dealing with the points will manage that.

The co-ordinates of the corners are expressed in terms of the grid of the basic picture elements called "pixels", which are available to you. The stored pairs:

10,10 10,50 50,50 50,10 10,10

define a square. Notice that there are five sets of co-ordinates, not just four. The computer has to be told to join up the fourth point to the starting point, and so you must name it again.

In a sort of pseudo-Basic, this might be expressed:

```
FOR I=1 TO 4
connect X(I), Y(I) to X(I+1), Y(I+1)
NEXT I
```

if the points are stored in arrays X(1 to 5) and Y(1 to 5).

On many computers, you would have to plot the first point, then just give the next point and the instruction to join it to the previous point, with a line or draw command.

Plotting a square is simple enough; things become interesting when you start to perform any one, or more, of the many possible "transformations" on that square, merely by operating on the numbers.

Multiplying them all by two gives a bigger square defined by points at:

20,20 20,100 100,100 100,20 20,20

Divide the numbers by, say, 10 and the square shrinks dramatically. Adding six to each number makes the shape move up and to the right. Halve all the X values, and it appears thin; halve the Ys, and it becomes flattened and squat.

Though we are describing the changes in terms of shape, it is only the numbers that are being defined and operated on. You have to assume some program for translating them into a visual form, at the time or maybe later, when you have finished manipulating the symbolically-represented shape.

Try these operations now, using a piece of paper or a computer. What happens?

```
X=X*Y/20
Y=-Y
Y=Y*SIN(X)
```

Here, X and Y mean "all the X values" or "all the Y values".

If you have not done so, try writing a program that lets you perform experiments on shapes like the one we have described. It must allow you to draw out some shape represented by pairs of numbers, and then allow you to alter all the numbers systematically and redraw the new shape. Use a For-Next loop, in Basic, to do the same thing to each X and/or Y.

You should now be able to see how a line drawing of a car body can rotate in those TV commercials. To work in three dimensions you just have to operate on the points with simple sines and cosines to give rotations — admittedly, there are a large number of points. The three-dimensional symbolic representation is then mapped on to a flat screen by altering each X and Y co-ordinate depending on how "deep" it is in the screen. A simple perspective algorithm does that job.

SuperCalc™

SuperCalc has a direct positive effect on your business profits, making optimum use of your time and energy. Using SuperCalc decision makers can manipulate data quickly and accurately for in-depth analysis. Accountants, Planners, Engineers and Businessmen have found SuperCalc invaluable.

SuperCalc really is easy to use, it only takes a second to alter figures – SuperCalc automatically calculates the rest of the Spreadsheet. It's self explanatory: just press the ? key if you need assistance.

SuperCalc's editing capabilities are more powerful than other packages, you can edit entire commands, not just one letter at a time. You can plug in a repeating formula simply by typing a one letter command and telling SuperCalc which entries are affected. Unlike other packages SuperCalc shows the user exactly where an error has occurred. And to prevent accidents all data can be protected from new manipulations.

Find out more about SuperCalc, send your Company order or telephone us now.

Superior easy to use CP/M* spreadsheet Simulator from LSI

* CP/M is a registered trade mark of Digital Research

£190 +VAT

Post and Package Extra

LSI COMPUTERS

Copse Road, St Johns, Woking, Surrey GU21 1SX Tel: (04862) 23411 Telex: 859592

DISTRIBUTORS

LSI Computers (Manchester), Genesis, Birchwood Science Park, Risley, **WARRINGTON,** Cheshire WA3 7BH. Tel: Padgate (0925) 824660.
LSI Computers (Croydon), Restmor Way, Hackbridge Road, **HACKBRIDGE,** Surrey SM6 7AG. Tel: 01-773 0917.
LSI Computers (South East), 4 Springfield Road, **HORSHAM,** West Sussex RH12 2PN. Tel: Horsham (0403) 64363.
LSI Computers (South West), West House, Stawell, **BRIDGWATER,** Somerset TA7 9AA. Tel: 0278 722073.
Encotel Systems Ltd., 530-538 Purley Way, **CROYDON,** Surrey. Tel: 01-686 9687.
Roundhill Computer Systems Ltd., Axholme, London Road, **MARLBOROUGH,** Wiltshire SN8 1LR. Tel: Marlborough (0672) 54675 Telex: 444453 Aware G.
KGB Micros Limited, 14 Windsor Road, **SLOUGH,** Berks SL1 1EL. Tel: Slough 38881/38310 Telex: 847777 Delray G Attn KMICRO

* I enclose my order for.....SuperCalc Spreadsheet Simulator System($) price £190.00 plus VAT. * Contact me with full details of new Superior SuperCalc.

Name

Address

Company

Tel

System

* Delete which ever necessary.

118

● Circle No. 174

Open File

This new section of *Practical Computing* will be appearing in the magazine each month, incorporating Tandy Forum, ZX-80/81 Line-up and the other software interchange pages.

Open File is the part of the magazine written by you, the readers. All aspects of microcomputing are covered, from games to serious business and technical software, and we welcome contributions on CP/M, BBC Basic, Microsoft Basic, Apple Pascal and so on, as well as the established categories.

Each month the best contribution will be awarded £20; others receive £6. Send contributions to: Open File, *Practical Computing*, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Z-80 Zodiac: Print from 380-Z colour graphics; Music on the Sharp; List machine-code on Nascom 119
ZX-80/81 Line-up: Ghost-ship Attack; Fast-moving graphics; Read/data 125
6502 Special: Determinant evaluation on floating-point Atom; UK101 false error-code suppression; Direct equation entry to Superboard 133
Pet Corner: Bloodstream; Mailing list 134
Apple Pie: Paint a picture with standard paddles; Heart throb enhancement for Space Invaders; Toolkit fault; Grandfather clock; Data tabulator; Read-from-screen routine 141
Tandy Forum: Protecting code; Road racing 144

Guidelines for contributors

Programs should be accompanied by documentation which explains to other readers what your program does and, if possible, how it does it. It helps if documentation is typed or printed with double-line spacing — cramped or handwritten material is liable to delay and error.

Program listings should, if at all possible, be printed out. Use a new ribbon in your printer, please, so that we can print directly from a photograph of the listing and avoid typesetting errors. If all you can provide is a typed or handwritten listing, please make it clear and unambiguous; graphics characters, in particular, should be explained.

We can accept material for the Pet, Vic and Sharp MZ-80K on cassette, and material for the larger machines can be sent on IBM-format 8in. floppy discs.

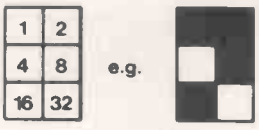
Z-80 ZODIAC

Colour copier

THIS PROGRAM for the Research Machines 380-Z copies colour pictures on to a normal printer, writes A Pennell of Cliftonville, Kent.

The program requires Basic V 5.0 H, and a printer of at least 80 columns that can handle the "chunky" graphics; I use a Microline 80. It copies medium resolution — 160 by 95 — colour pictures, but obviously only distinguishing between colour 0 — black — and any other colour. It could be modified by changing the X and Y For loops for high resolution, but only if a 160-column printer is used.

Line 10 sets up the printer, and should be modified to suit. Line 20 fools the 380-Z into thinking it is a very wide printer, to prevent spurious Newline characters upsetting the output. This should not be changed. The X and Y loops step through the screen, starting at top left — 0,94 — in sections of 2-by-3 pixels. These sections are then converted to the ASCII chunky character codes, by adding the base colour, 128, to powers of two if that pixel is on



=1+2+8+16+128=CHR$(155)

The function

CALL "RDOUT",X,Y,VARADR(P)

calls a machine-code subroutine resident in the interpreter which loads P with the colour at the point X,Y.

(continued on next page)

```
10  PRINTER 4,4 : LPRINT CHR$ (30)
20  LWIDTH 255
30  FOR Y=94 TO -2 STEP -3
40  FOR X=0  TO 160 STEP 2
50  S=.5:C=128:P=0
60  FOR B=2 TO 0 STEP -1
70  FOR A=0 TO 1
80  S=S*2
90  CALL "RDOUT",X+A,Y+B,VARADR(P)
100 IF P<>0 THEN C=C+S
110 NEXT A
120 NEXT B
130 LPRINT CHR$(C);
140 NEXT X
150 LPRINT
160 NEXT Y
170 LPRINT
```

(continued from previous page)

Sharp music

MUSIC is a small Basic program from C J Davison of Newton Abbott, Devon, that simulates a simple organ. It also allows the user to add his own notes or other effects. The program is written in XTAL Basic but can be converted to Sharp Basic by changing Call in lines 70, 80 and 90 to USR( ). The program should run on any machine since it only occupies 1.2K.

The machine-code routine scans the keyboard to see if any key is depressed. If it is, it returns the ASCII value which is Peeked into 1. To return to Basic just Shift/Break out.

```
10   REM MUSIC KEYBOARD
20   DIM A(255), B(255), C(255)
30   REM SET UP M/C ROUTINE
40   FOR Z=24553 TO 24560: READ A: POKE Z,A: NEXT
50   FOR Z=1 TO 36: READ A(Z), B(A(Z)), C(A(Z)):NEXT Z: GOSUB 200
60   REM MAIN PROGRAM
70   CALL 24553: I=PEEK(24560)
80   IF I=0 THEN CALL 71: GOTO 70
90   POKE 4514,B(I): POKE 4513,C(I): CALL 68: GOTO 70
100  REM DATA ASC11, 4514,4513
110  DATA 205,27,0,50,240,95,201,0,71,18,208
120  DATA 81,17,196,87,15,212,69,14,238
125  DATA 82,13,78,84,11,218,89,11,48,85,9,248
130  DATA 73,8,226,79,7,234,80,7,119,61
135  DATA 6,167,229,5,237,244,5,152,236,4,252
140  DATA 218,4,113,115,3,245,90,29,220
145  DATA 88,26,156,67,23,180,86,22,96,66,19,240
150  DATA 49,16,196,51,14,24,52,12,142,54
155  DATA 10,144,55,9,104,56,8,98,48,7,12
160  DATA 45,6,71,221,5,72,203,4,180,209
165  DATA 4,49,65,28,48,83,25,28,70,21,32
200  REM PRINT KEY POSITIONS
210  PRINT "(CLS) TOP ROW.....SHARPS"
220  PRINT "(cursor down * 3) SECOND ROW...A-A-AB"
230  PRINT "(cursor down * 3) THIRD ROW...SHARPS"
240  PRINT "(cursor down * 3) LAST ROW.....C-G"
250  PRINT "(cursor down * 3) ***SHARPS ABOVE NOTES ***"
260  PRINT "(cursor down * 3) ***RELEASE KEY TO STOP***"
270  RETURN
280  END
```

Machine-code transfer

A PROGRAM to copy Zeap listings into Naspen comes from C R Bruce of Farnham, Surrey. It adds the Zeap file to the end of the Naspen text but does not upset any pointers. This allows you to include assembler programs in letters or explanatory notes, for example:

```
; BLOCK SEARCH
  LD HL,START OF BLOCK
  LD BC,LENGTH OF SEARCH
  LD A,ITEM TO BE SEARCHED FOR
  CPIR
```

This powerful Z-80 command compares the A register with the byte pointed to by HL. If the result is not zero and BC is not zero then HL is incremented, BC is decremented and the comparison is made again until the byte is found or BC becomes zero.

The program is written in assembler. The object code is included for those without an assembler — the last column is a check-sum and must not be entered.

Zeap files transfer.

```
  ORG £C80      ; THIS IS WHERE IT'S AT
  LD HL,(£101A) ; NASPEN EOT PNTR
  LD BC,0       ; TRANSFERED  CHAR COUNTER
  EXX           ; SWOP NASPEN & ZEAP PNTRS
  LD HL,(£F00)  ; START OF ZEAP TEXT
  LD DE,4H      ; OFFSET
  ADD HL,DE     ; ADD THE OFFSET
  XOR A         ; CLEAR A
THERE LD A,(HL) ; GET 1st ZEAP CHAR
  CP 0          ; IS IT ZERO
  JR Z,CRLF     ; IT IS !
  INC HL        ; IT ISN'T! SO...
  EXX           ; GET NASPEN POINTER
  LD (HL),A     ; PUT IN CHAR
  INC BC        ; COUNT THIS
  INC HL        ; POINT AT NEXT NASPEN SPACE
  EXX           ; GET BACK TO ZEAP
  JR THERE      ; DO IT AGAIN
CRLF INC HL    ; CR LF SUBROUTINE
  LD A,(HL)     ; GET NEXT ZEAP CHAR
  CP £FF        ; ZEAP ENDS WITH FFH
  JR Z,ENDIT    ; IT IS ! GO TO END
  INC HL        ; IT ISN'T, BYPASS NEXT CHAR
  INC HL        ; GET NEXT CHAR
  LD A,(HL)     ; LOOK FOR FLAG
  CP 20H        ; IS IT A SPACE
  CALL Z,SPACE  ; YES. MAKE A NOTE
  EXX           ; GET BACK TO NASPEN
  LD (HL),£0D   ; PUT IN CRLF
  INC BC        ; COUNT THIS ONE
  INC HL        ; MOVE ON
  LD (HL),£0D   ; DOUBLE LINED IF YOU WANT
  INC BC        ; COUNT THIS ONE
  INC HL        ; MOVE ON
  LD A,(NOTE+1) ; GET THE NOTE
  CP 1          ; WAS IT MARKED
  JR NZ,HERE    ; YES,IF SPACE, HAVE ANOTHER
; IF NOT, MUST BE FLAG SO MISS SPACE
  LD (HL),£20   ; PUT IN A SPACE
  INC BC        ; COUNT THIS
  INC HL        ; GET READY FOR NEXT TIME
HERE EXX       ; GET BACK TO ZEAP
  LD A,0        ; FOR NOTEBOOK
  LD (NOTE+1),A ; CLEAR NOTE
  JR THERE      ; START ALL OVER AGAIN
ENDIT EXX      ; THIS WHERE TO GET OUT
  LD (HL),£20   ; PUT IN A SPACE
  INC HL        ; MOVE ALONG
  LD (HL),£FF   ; NASPEN ENDS WITH FFH TOO
  LD HL,(101AH) ; START OF NASPEN TEXT PNTR
  ADD HL,BC     ; ADD CHAR CNT TO START PNTR
  INC HL        ; ONE FOR THE POT
  LD (£101A),HL ; LOAD THIS TO NASPEN PNTR
  JP £B806      ; JUMP TO NASPEN WARM START
SPACE LD A,1   ; FOR NOTEBOOK
  LD (NOTE+1),A ; I HAVE SEEN A SPACE
NOTE RET       ; R(h)ETORICALLY GO ESLEWHERE
; DELETE 35,36,37, FOR SINGLE SPACING.
This is printed from NASPEN.
```

Object-code listing.

```
T C80 CDC FF
 0C80 2A 1A 10 01 00 00 D9 2A E4
 0C88 00 0F 11 04 00 19 AF 7E FE
 0C90 FE 00 28 08 23 D9 77 03 40
 0C98 23 D9 18 F3 23 7E FE FF 49
 0CA0 28 24 23 23 7E FE 20 CC A6
 0CA8 D7 0C D9 36 0D 03 23 36 0F
 0CB0 0D 03 23 3A DD 0C FE 01 11
 0CB8 20 04 36 20 03 23 D9 3E 7B
 0CC0 00 32 DD 0C 18 C9 D9 36 D7
 0CC8 20 23 36 FF 2A 1A 10 09 A9
 0CD0 23 22 1A 10 C3 06 B8 3E 0A
 0CD8 01 32 DD 0C C9 00 FF 00 C8
```

● Circle No. 175 ▶

Make the most of your Sinclair ZX Computer...

Sinclair ZX software on cassette.

£3.95 per cassette.

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions.

Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J.H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

How to order

Simply use the order form below, and either enclose a cheque or give us the number of your Access, Barclaycard or Trustcard account. Please allow 28 days for delivery. 14-day money-back option.

sinclair
ZX SOFTWARE

Sinclair Research Ltd,
6 Kings Parade, Cambridge,
Cambs., CB2 1SN. Tel: 0276 66104.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. Please print
Please send me the items I have indicated below.

Qty	Code	Item	Item price	Total
	21	Cassette 1 – Games	£3.95	
	22	Cassette 2 – Junior Education	£3.95	
	23	Cassette 3 – Business and Household	£3.95	
	24	Cassette 4 – Games	£3.95	
	25	Cassette 5 – Junior Education	£3.95	
	17	*8K BASIC ROM for ZX80	£19.95	
	18	*16K RAM pack for ZX81 and ZX80	£49.95	
		*Post and packing (if applicable)	£2.95	
			Total £	

*Please add £2.95 to total order value only if ordering ROM and/or RAM.

I enclose a cheque/PO to Sinclair Research Ltd for £

Please charge my Access*/Barclaycard/Trustcard no.

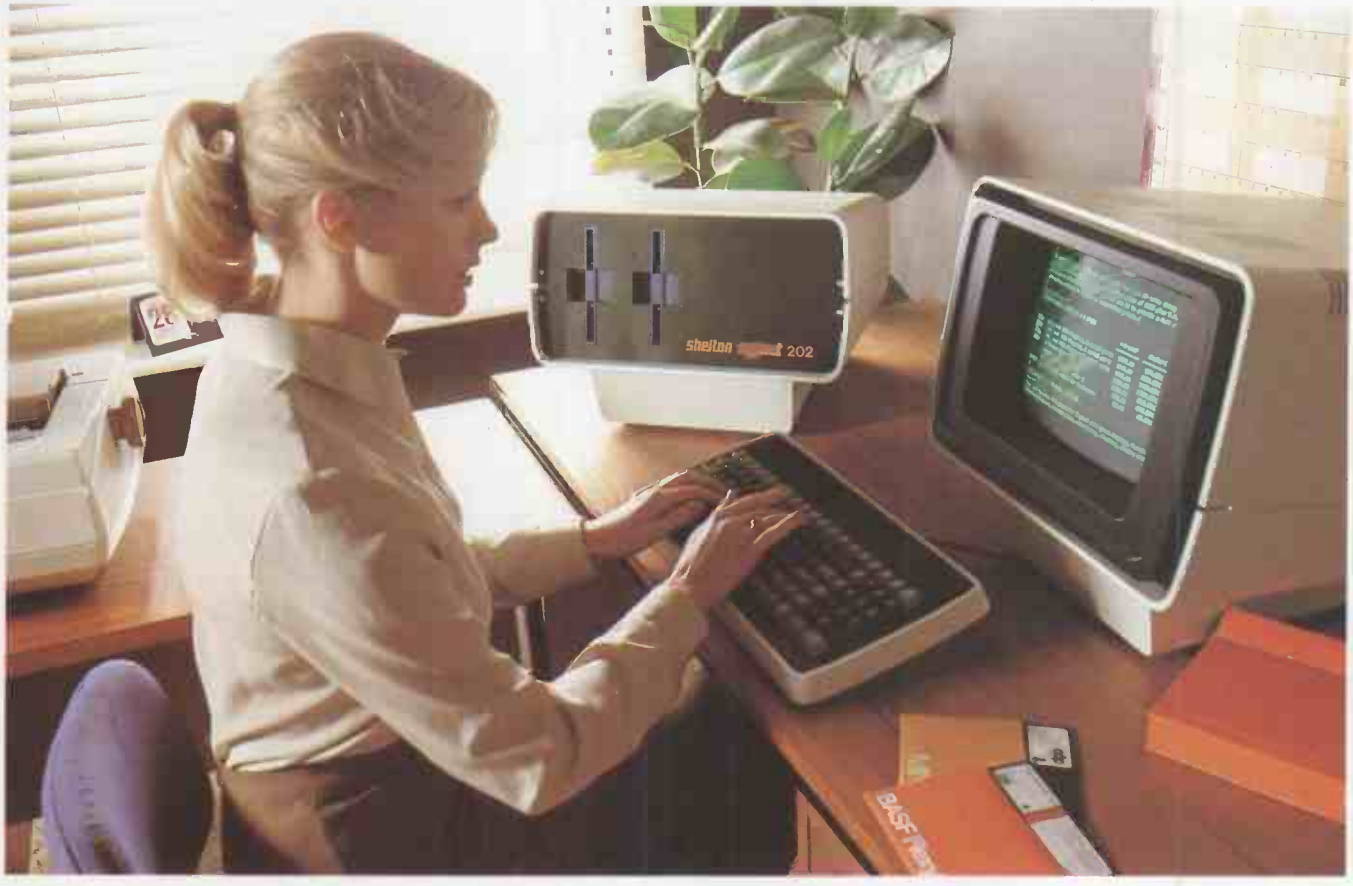
*Please delete as applicable.

Name: Mr/Mrs/Miss

Address:

PRCO3

THE MICROPUTE CHALLENGE:– FIND A COMPUTER TO COMPARE WITH THE sig/net ...NEVER.



. . . Because the SIG/NET offers the price advantage of the low cost systems together with the flexibility and infinite expansion capabilities of the high cost systems.

Or in other words a great deal more for a great deal less.

For just **£1,299.00** the standard SIG/NET offers the flexibility to choose the terminal best suited to your requirements, the printer to give the speed and quality you need and disk capacity from 400,000 to 40 Million characters.

The standard SIG/NET 202S	**£1,299.00**
5 Megabyte hard disk system	**£3,100.00**
10 Megabyte 4 User	**£6,000.00**
10 Megabyte 10 User	**£9,500.00**

FOR FURTHER TECHNICAL DATA AND THE NAME OF YOUR NEAREST DEALER SEND THE COUPON **NOW!**

MICROPUTE
Catherine Street, Macclesfield, Cheshire, SK11 6QY. Tel: (0625) 612759.

NAME _____ POSITION _____

COMPANY NAME _____

COMPANY ADDRESS _____

_____

_____ TEL. NO. _____

Dealer enquiries invited for certain areas of the Midlands and North.

THERE'S JUST NONE TO COMPARE.

- **Unbeatable value for money.**
- **Advanced and innovative BRITISH design.**
- **BRITISH BUILT.**
- **Unrivalled expansion.**
- **Faster than comparable systems.**
- **Full 64K of memory.**
- **Sold only through approved dealers.**
- **CP/M compatible.**

MICROPUTE

MICROPUTE
microcomputer systems
Catherine Street,
Macclesfield,
Cheshire,
SK11 6QY.
Tel: (0625) 612759.

Pages 123 and 124 are missing

Dangerous addiction

THIS GAME is addictive, warns David Lawrence of Southampton; do not introduce your friends to it late in the evening, or you will still be sitting there in the early hours while they have "just one more try". Strikeout, the game in question, is an essentially simple game where you aim a projectile at a target on the screen, giving speed and trajectory for the shot which then follows a ballistic trajectory.

So what makes it addictive? The answer is that the whole trajectory is not printed out, only points along it. The interval between those points is randomly chosen for each new target position and remains constant until that target has been hit. To hit the target you not only have to make the trajectory pass through target position, but also make one of the plotted points coincide with it too.

The game begins by the setting of the target — an inverse space — on the right-hand side of the screen. The number of the shot and requests for speed and angle

then appears in the top left-hand corner.

Typical speeds range between 700 and 1,100 and angles are entered in degrees. The lower the speed, the smaller is the gap between plotted points, since the random element is the time interval at which the trajectory is plotted. At the end of each shot, whether it is a hit or a miss, the shot remains displayed on the screen until Newline is entered. The screen then clears and resets. If you have missed, the target resets in the same position.

The game strains the memory of a 1K ZX-81, not so much by the program itself but because of the demand for screen memory. On rare occasions, such as a high lob from one side of the screen to the other, you may run out of memory.

If you do not mind the small extra effort, you can replace the few remaining literals with variables whose value is entered in direct mode, remembering not to use Run. Note also that S=P=P and T=P=P are both three bytes shorter than S=1 and T=O.

When you are familiar with the game you can increase the difficulty. This can be done either by reducing the value by which RND is divided in line 220, thus increasing the randomness of the intervals, or by replacing the 0.5 in the same line by a larger value, thus increasing the average interval between plotted points.

```
DAVID A LAWRENCE
100 LET M=28
200 LET P=INT (RND*20)
210 LET S=P=P
220 LET T=RND/5+.5
230 LET T2=T
250 CLS
260 LET T=P<>P
270 PRINT AT P,M;"(graphic H)"
280 PRINT AT T,T;">";S,,"SPEED?";
300 INPUT V
310 PRINT V,,"ANGLE?";
340 INPUT A
350 PRINT A
360 LET A=A*.0174
370 LET X=INT (V/M*T*SIN
A-(4.9*T*T)
375 LET Y=INT (T*V/M*COS A)
380 IF Y>63 OR X>43 OR X<0 THEN
GOTO 470
390 PLOT Y,X
400 LET T=T+T2
410 IF INT (Y/2)=M AND 21-INT
(X/2)=P THEN GOTO 430
420 GOTO 370
430 UNPLOT Y,X
440 PRINT "HIT"
450 INPUT A$
460 GOTO S
470 LET T=T2
480 INPUT A$
490 LET S=S+1
500 GOTO 250
```

Format subroutine

THE FORMAT SUBROUTINE by Mark Franklin of Erith, Kent, runs on the ZX-81, and ZX-80 with 8K ROM. Num is the number to be formatted. N$ is the number on return from the subroutine, i.e., the number that is printed out. AF is the number of places after the decimal point, if there is one. PL in the number of places before the decimal point.

If AF = 0 the decimal point is completely suppressed. The maximum value of AF is eight, that is the number of zeros in the string in line 9050; the maximum for PL is 10, which must be the same as the number of spaces in line 9090.

```
ZX81 Format Routine.
  Mark Franklin.
9000  LET N$ = STR$ NUM
9010  FOR Z = 1 TO LEN N$
9020  IF N$(Z)="." THEN GOTO 9050
9030  NEXT Z
9040  LET N$=N$+"."
9050  LET N$=N$+"00000000"
9060  IF AF<=0 THEN LET Z=Z-1
9070  LET N$(Z+1 TO )=N$(Z+1 TO AF+Z)
9080  IF AF<=0 THEN LET Z=Z+1
9090  LET N$="(10 SPACES )"
9100  RETURN
```

Taxing demands

A PRACTICAL PROGRAM for the employees to check their pay, tax and National Insurance records comes from Sean Sweeney of Wootton, Bedfordshire.

The tax and NI deductions are standard rate only — 30 percent and 7.75 percent respectively. They are calculated to agree with the manual tables and will probably differ from most computerised payrolls. When the program is run it will request:

Weekly or monthly paid? — enter "W" or "M".
Tax code? — this must be numeric only for standard codes, suffix H, L, P, T or V.
Previous total taxable pay TD? — this is the total gross pay for the current tax year up to

(continued on next page)

◀● 179 for p124

(continued from previous page)

and including the previous pay period.

Total tax deducted TD? — this is the total net tax deducted/refunded for the current tax year, up to and including the previous pay period. Enter minus amount for refund.

Tax month/week number? — this pay period number, per tax year.

Basic pay? — normal pay for the period.

Additional pay, holiday pay, etc? — extra taxable pay period paid this period, i.e. commission, overtime, bonus, holiday pay, etc.

Tax-free pay or EXP/S — any non-taxable reimbursements, etc.

Deductions? — any other deductions after tax and NI.

Number of weeks holiday pay? — if holiday pay has been included in additional pay then enter number of weeks holiday period pay paid, i.e. 1, 2 or 3.

The following variables are used:

M$	for "monthly" or "weekly" calculation input.
TC	tax code.
TG	previous total gross taxable pay to date.
TT	previous total tax deducted to date.
M	month or week number.
B	basic pay.
AP	additional pay.
TF	tax free pay.
OD	other deductions.
Z	free pay calculation — addition to tax code.
W	free pay calculation — 12 or 52 for months or weeks.
P	used in free pay calculation.
FP	free pay.
T	taxable.
TD	tax due.
X	tax this week.
G	gross taxable pay this week.
C	used in NI calculation.
D	used in NI calculation.
E	employee's NI this week.
H	number of weeks' holiday pay.

```
 SEAN D SWEENEY

 1    REM "TAX CALCULATOR"
 10   CLEAR
 20   PRINT "WEEKLY OR MONTHLY PAID?"
 30   PRINT
 40   PRINT "ENTER","""M"" FOR MONTHLY"
 50   PRINT """W"" FOR WEEKLY"
 60   INPUT M$
 70   IF M$="M" THEN LET Z=9
 80   IF M$="M" THEN LET W=12
 90   IF M$="W" THEN LET Z=11.4
 100  IF M$="W" THEN LET W=52
 110  CLS
 120  SCROLL
 130  PRINT "TAX CODE?"
 140  INPUT TC
 150  SCROLL
 160  PRINT "ENTER PREV. TOTAL TAXABLE PAY TD"
 170  INPUT TG
 180  SCROLL
 190  PRINT "ENTER TOTAL TAX DEDUCTED TD"
 200  INPUT TT
 210  SCROLL
 220  PRINT "TAX MONTH/WEEK NUMBER?"
 230  INPUT M
 240  SCROLL
 250  PRINT "THIS WEEKS/MONTHS BASIC PAY?"
 260  INPUT B
 270  SCROLL
 280  PRINT "ADDITIONAL PAY,HOL.PAY ETC.?"
 290  INPUT AP
 300  CLS
 310  IF M$="W" THEN GOSUB 1000
 320  SCROLL
 330  PRINT "ENTER ANY FREE PAY OR EXP/S"
 340  INPUT TF
 350  SCROLL
 360  PRINT "ENTER ANY DEDUCTIONS"
 370  INPUT OD
 380  CLS
 390  REM * FREE PAY CALC. *
 400  LET P=INT ((TC*10+Z)/W*100)/10
 405  IF M$="W" THEN GOTO 440
 410  LET FP=(INT P/10+.05)*M
 420  IF INT ((P-INT P)*100) > 50 THEN LET
FP=(INT P/10 + .10) *M
 430  GOTO 460
 440  LET FP=INT P/10*M
 450  IF INT ((P-INT P) *100 ) >= 50 THEN LET
FP=(INT P/10+.05) * M
 460  REM * TAXABLE *
 470  LET TG=INT ((TG+B+AP)*100 +.5)/100
 480  LET T=INT (TG-FP)
 490  IF FP>TG THEN GOTO 930
 500  REM * TAX DUE *
 510  LET TD=T*.30
 520  REM * TAX THIS WEEK *
 530  LET X=INT ((TD-TT)*100+.5)/100
 540  LET G=INT ((B+AP)*100+.5)/100
 550  IF X>G THEN GOTO 970
 560  IF M$="W" THEN GOTO 660
 570  REM * MONTHLY N/I *
 580  LET C=INT G
 590  IF NOT INT (INT G/2)*2=INT G THEN LET
C=INT G+1
 600  LET D=C*.0775
 610  LET E=INT (D*100+.49)/100
 620  IF G<117 THEN LET E=0
 630  IF G=117 THEN LET E=9.07
 640  IF G>=866.67 THEN LET E=67.17
 650  GOTO 740
 660  REM * WEEKLY N/I *
 670  LET C=INT G+.25
 680  IF INT ((G-INT G) *100)>=50 THEN LET C=INT
G+.75
 690  LET D=C*.0775
 700  LET E=INT (D*100+.49)/100
 710  IF G<27 THEN LET E=0
 720  IF G=27 THEN LET E=2.09
 730  IF G>=200 THEN LET E=15.5
 740  PRINT "PAYE AND N/I", "PERIOD";M
 750  PRINT "CODE ";TC
 760  PRINT "BASIC PAY",B
 770  PRINT "ADDITIONAL PAY",AP
 780  PRINT "GROSS PAY",G
 790  PRINT
 800  PRINT "TAXABLE PAY",T
 810  PRINT
 820  PRINT "TAX",X
 830  PRINT "N/I",E
 840  PRINT
 850  PRINT "TAX FREE PAY",TF
 860  PRINT "OTHER DEDS.",OD
 870  PRINT
 880  PRINT "NET PAY",INT
((G-X-E+TF-OD)*100+.5)/100
 890  PRINT
 900  PRINT "TOTAL GROSS YTD",TG
 910  PRINT "TOTAL TAX YTD",INT
((TT+X)*100+.5)/100
 920  GOTO 2000
 930  REM * TAX REFUND *
 940  LET X=0
 950  IF TT>0 THEN LET X=-TT
 960  GOTO 540
 970  PRINT "TAX IS GREATER THAN PAY"
 980  GOTO 2000
 1000 PRINT "NUMBER OF WEEKS HOLIDAY PAY", "PAID
THIS WEEK?"
 1010 INPUT H
 1020 LET M=M+H
 1030 CLS
 1040 RETURN
 2000 PRINT
 2010 PRINT "ANOTHER RUN?"
 2020 PRINT "ENTER","""Y"" FOR YES"
 2030 PRINT,"""N"" FOR NO"
 2040 INPUT A$
 2050 CLS
 2060 IF A$="Y" THEN GOTO 10
 2070 STOP
PAYE AND N/I          PERIOD 4
                      CODE 213
BASIC PAY             555.55
ADDITIONAL PAY        0
GROSS PAY             555.55
TAXABLE PAY           1441
TAX                   -47.7
N/I                   43.09
TAX FREE PAY          100
OTHER DEDS.           25
NET PAY               635.16
TOTAL GROSS YTD       2154.55
TOTAL TAX YTD         432.3
ANOTHER RUN?
ENTER                 "Y" FOR YES
                      "N" FOR NO
```

Fast-moving graphics

TWO PROGRAMS for the 1K ZX-81 come from I J Moore of Nottingham. Although they are not written in machine-code, they both have fast-moving graphics.

In Missile Dodger you are captain of a cargo ship which is under fire from alien raiders. You have to dodge the many missiles fired at you by using cursor controls 5 and 8 to move to the left and right respectively. You may be hit five times before being totally obliterated.

If you have the 16K RAM pack, then the program can be made more difficult by changing line 120 to:

120 IF PEEK (P S) 23 THEN LET L=L-1

changing line 130 to:

130 PRINT AT 0,W;"(3 SHIFT A)

and adding:

115 FOR S=W TO W+2
125 NEXT S

or by adding:

85 PRINT AT 16,X 2;" "

In Grand Prix you are a racing driver. As the track looms in front of you, you must steer your way through the cones without hitting any of them. Added danger is provided by jamcars which appear at random.

Once again, cursor controls 5 and 8 move you to the left and right respectively. The program can be made more difficult by removing lines 120 and 130 and shortening the width of the track in line 100.

```
IAN MOORE

MISSILE DODGER

10   LET L=5
20   LET W=14
30   LET G=0
40   LET P=1+PEEK (16396)+PEEK (16397)*256
50   LET X=INT (RND*25)
60   LET G=G+1
70   PRINT AT 18,X+4;"*"
80   PRINT AT 20,X;"*"
90   SCROLL
100  SCROLL
110  PRINT AT 0,31;" "
120  IF PEEK (P+W)=23 OR PEEK (P+W+1)=23 THEN LET
     L=L-1
130  PRINT AT 0,W;"(2 SHIFT A)"
140  IF INKEY$="5" AND W>6 THEN LET W=W-1
150  IF INKEY$="8" AND W<26 THEN LET W=W+1
160  IF L<1 THEN GOTO 180
170  GOTO 50
180  PRINT G;" EONS"
```

```
GRAND PRIX

10   LET X=11
20   LET A=16
30   LET T=3
40   LET K=0
50   LET P=1+PEEK (16396)+PEEK (16397)*256
60   LET W=INT (RND*20-10)
70   LET F=SGN (W)
80   IF X+F<2 OR X+F>23 THEN GOTO 60
90   LET X=X+F
100  PRINT AT 21,X;"(1 SHIFT 5)(5 SPACES)(1 SHIFT 5)"
110  IF W=5 THEN PRINT AT 21,X+3;"H"
120  SCROLL
130  SCROLL
140  SCROLL
150  PRINT AT 0,31;" "
160  IF PEEK (P+A)=5 OR PEEK (P+A)=45 THEN LET T=T-1
170  PRINT AT 0,A;CHR$ (156+T)
180  IF INKEY$="5" THEN LET A=A-1
190  IF INKEY$="8" THEN LET A=A+1
200  LET K=K+1
210  IF T<1 THEN GOTO 230
220  GOTO 60
230  PRINT K;" LAPS"
```

Drawing the line

THE SKETCH-PAD program allows you to draw pictures on the screen and erase any mistakes, writes Antony Lugger of Ivybridge, Devon. When the program is run and any key depressed, a black dot appears in the centre of the screen. A line can be drawn from this dot in any direction by depressing the appropriate key. To erase a line, the shift key should be pressed with the key for the appropriate direction.

To change the starting position the values of X and Y in lines 10 and 20 should be changed.

```
10 LET X=32
20 LET Y=22
22 PLOT X,Y
25 LET A$=INKEY$
31 IF A$="Q" OR A$="W" OR A$="E" THEN LET Y=Y+1
32 IF A$="Q" OR A$="A" OR A$="Z" THEN LET X=X-1
33 IF A$="Z" OR A$="X" OR A$="C" THEN LET Y=Y-1
34 IF A$="E" OR A$="D" OR A$="C" THEN LET X=X+1
35 IF A$="""" OR A$=" OR "OR A$=" STEP " THEN LET Y=Y+1
36 IF A$=":" OR A$=";" OR A$="?" THEN LET Y=Y-1
37 IF A$="""" OR A$=" STOP " OR A$=":" THEN LET X=X-1
38 IF A$="STEP  " OR AS=" SLOW " OR A$="?" THEN LET X=X+1
40 IF CODE A$ 37 OR CODE A$ 64 THEN PLOT X,Y
42 IF LEN AS=0 THEN GOTO 25
45 IF CODE A$<38 OR CODE A$>63 THEN UNPLOT X,Y
50 GOTO 25
```

Ghost-ship attack

MY GAME Ghost Ship Attack, will just squeeze into a 1K ZX-80, writes Noel Swanton of Wellington, New Zealand. Apart from the command ship, all the attackers remain invisible until the game ends. The object of the game is to destroy the command ship before it reaches the left-hand side of the display or it, or one of the ghost ships, destroys you.

Lines 40 to 80 randomly position the ghosts.
Lines 90 to 160 print the display.
Line 170 compensates for memory movement.
Lines 190 and 200 position the defender and alien command ship.
Lines 220 to 330 position player's decoys, and will display a white square if a ghost is found.
Lines 350 to 400 move the defender's ship and deletes the old position.
Line 410 checks for a win.
Lines 420 to 485 set new positions for the ghost fleet and command ship, and prints a white square if a decoy is encountered.
Lines 500 to 530 identify the winner.
Lines 540 to 560 print positions of ghosts.
Lines 600 and 610 form a subroutine which finds the start of display.

```
10    DIM A(7)
20    LET M=0
30    LET P=79
40    LET A(7)=102
50    FOR J=0 TO 6
60    LET A(J)=J*26+RND(14)+12
70    IF A(J)=102 THEN LET J=J-1
80    NEXT J
90    FOR K=0 TO 6
100   PRINT CHR$(151);
110   FOR J=0 TO 23
120   PRINT CHR$(128);
130   NEXT J
140   PRINT
150   NEXT K
160   PRINT "D"
170   LET K=4
180   GOSUB 600
190   POKE P+C,23
200   POKE A(7)+C,20
210   IF M>6 THEN GOTO 340
220   LET N=151
230   INPUT X
240   GOSUB 600
250   LET Y=M*26+X
260   FOR J=0 TO 6
```

(continued on next page)

(continued from previous page)

```
270   IF A(J)=Y THEN LET N=0
280   NEXT J
290   POKE Y+C,N
300   POKE M*26 + C,128
310   LET M=M+1
320   LET K=1
330   GOTO 210
340   POKE C +182 , 23
350   INPUT X
360   POKE P+C,128
370   IF X=5 THEN LET P=P-3
380   IF X=6 THEN LET P=P+25
390   IF X=7 THEN LET P=P-27
400   LET P=P+1
410   IF P=A(7) THEN GOTO 500
420   POKE A(7)+C,128
430   LET Y=1
440   LET N=RND(2)
450   FOR J=0 TO 7
460   LET A(J)=A(J)-N
470   IF A(J)= P OR A(7)<79 THEN GOTO 520
480   IF PEEK(A(J)+C)=151 THEN POKE A(J)+C,0
485   NEXT J
490   GOTO 180
500   PRINT "YOU";
510   REM
520   PRINT "ALIENS";
530   PRINT"  WIN"
540   FOR J=0 TO 7
550   POKE A(J)+C,0
560   NEXT J
570   STOP
600   LET C=PEEK(16396)+PEEK (16397)*256+K
610   RETURN
```

ZX-81 Read/Data

THIS routine by C Rouse of Gosport, Hampshire, will give the ZX-81 a version of Read/Data, and can be useful whenever information has to be printed on the screen.

The Basic is entered first and the decimal codes Poked into the first-line Rem from 16514 to 16536 using a standard machine-code loading program. Items to be printed are included in the program in Rem statements. Each item must be less than 64 characters long and must be enclosed in inverted commas.

More than one item may be included in each Rem as long as each one has its own inverted commas, e.g.,

100 REM "DATA""READ"

There is no space between the middle inverted commas.

The data Rems can be put anywhere in the program area and can be separated by both normal Rem statements and program lines. With the Basic entered as shown

XX GOSUB RESTORE

will set the pointer to the first item to be printed and the Step to 1.

XX GOSUB READ

will then print the items out, one at a time, moving the pointer to the next item.

In order to print the item in the middle of a sentence use the following format:

100 PRINT "THE NEXT"
110 GOSUB READ
120 PRINT "WILL ARRIVE SOON"

If no Rem data statements exist, or if the program tries to call more than are available, an Error Code R/.. will result If the item to print is longer than the 64 characters an error code Q/.. will be the result. This will happen if the inverted commas are omitted from the end of the data.

The length of the last item printed is in 16519. Any value less than the total number of items can be Poked into Step at 16520. For example every other item can be printed by

XX POKE 16520, 2

Random items can be printed by

XX GOSUB RESTORE
XX LET A = INT (RND * N) + 1
XX POKE 16520, A
XX GOSUB READ

where N< total number of items. Gosub Restore will reset the Step to 1.

```
1 REM 123 FULL STOPS
2 LET RESTORE=5
3 LET READ=7
4 GOTO 9
5 RAND USR 16521
6 RETURN
7 RAND USR 16514
8 RETURN
9 REM PROGRAM AREA
```

```
16514 24,100,130,64,0,1,1,33,130,64
16524 34,132,64,62,0,50,134,64,60,50
16534 136,64,201,58,134,54,254,11,32,9
16544 42,132,64,35,34,132,64,24,30,237
16554 75,4,64,120,254,0,32,2,207,26
16564 62,234,42,132,64,237,177,34,132,64
16574 62,11,190,32,234,35,34,132,64,17
16584 0,0,6,64,62,11,190,40,6,19
16594 35,16,249,207,25,123,50,135,64,237
16604 91,132,64,35,34,132,64,126,50,134
16614 64,201,58,136,64,71,197,205,153,64
16624 193,16,249,58,135,64,79,6,0,205
16634 107,11,201
```

Table trouble

IF YOU KNOW anyone who is having trouble with their multiplication tables at school, Dean Asher of Harlow, Essex has a program for the 1K ZX-81 which may be of help.

Line 60 determines the number of lines; you can replace the number 20 with any other number you choose.

```
10   INPUT N
20   PRINT N;"X TABLE"
30   LET C=0
40   LET C=C+1
50   PRINT C; "X";N;"="C*N
60   IF C<20 THEN GOTO 40
```

Automatic run

THE ROUTINE from J F Brown of Edenbridge, Kent, allows a ZX-81 program to run automatically after loading. This is particularly useful and convenient when a program question contains a large quantity of data in string variables or numeric arrays. The Run command erases all the variables, but the autorun preserves the data by using Goto statements instead. It is particularly useful for business software as no Basic commands have to be entered.

After typing in the program, run and load the data. Then save the program and variables on cassette, type New and try reloading the program. It will run automatically and the data will be preserved.

```
J. F. Brown.
10   DIM A(10)
20   FOR X=1 TO 10
30   INPUT A(X)
40   NEXT X
50   CLS
60   PRINT"DATA PROGRAM"
70   FOR X=1 TO 10
80   PRINT A(X)
90   NEXT X
100  REM SAVING ROUTINE
110  INPUT A$
120  CLS
130  SAVE A$
140  GOTO 60
```

● Circle No. 180

Come to one of our
Free
Introductory
Seminars
at our Training
Centre in Andover

XEROX 820 ABC 26 N.E.C. PC8000 TABTIME 500 APPLE PET COMMODORE 8032 SUPERBRAIN

The universal business system

TABS unique business software is a flexible package designed to maximise business efficiency and profitability.

TABS is **universal**. The modular system currently running on PET, Apple and Superbrain will shortly be available on most CPM microcomputers.

TABS is also **modular**. Each of 13 modules may be run individually or together. Modules include: Sales Ledger, Purchase Ledger, Sales Order Processing, Invoice Compiler, Fast Data Entry, Nominal Ledger, Management Accounts, Job Costing, Payroll, Bill of Materials, Stock Control, Word Processor, Mail List.

The system is **fully integrated** so that updated information on one module automatically updates information on a related module e.g. items entered on the Sales Ledger would deplete Stock Control.

Each module is **parameter driven** enabling end users to adapt each module to suit their unique accounting requirements.

The TABS system is **upgradeable**. It bridges the gap between micro and mini computers facilitating expansion from the single user system to the multi user system on SYSTIME and D.E.C.

We would, however, like to add a word of caution to the end user. Naturally a package as flexible as this is a sophisticated product and although simple to operate we strongly advise professional help either from your Dealer or from TABS during its installation.

For more details about TABS software and hardware, please tick box(es) and return coupon to us. We are pleased to offer credit card facilities to our customers.

PC

Dealer enquiry

☐ Please send me details of your Dealer Plan

User enquiry

☐ Please send me details about TABS accounting systems

☐ Please send me the TABS User Manual £20 inc p&p

I enclose cheque/postal order for £ _____

Signature _____ 129

Name _____

Address _____

_____

Tel. No. _____

TABS Ltd, Sopers House, Chantry Way, Andover, Hants. SP10 1LU
Telephone: Andover (0264) 58933

Accounting Business Systems
TABS

we have the ADVANTAGE

The NORTH STAR ADVANTAGE is an attractive and powerful integrated graphics computer equally suited to both business and educational use.

The ADVANTAGE is a fast, (4MHz) Z80A based microcomputer with 64Kb (200ns) dynamic RAM.

The ADVANTAGE features:

* An auxiliary processor (Intel 8035 type) off loads the Z80A by servicing keyboard and disk drive control functions.
* A 12 inch non-glare green display screen, operating both Character Mode and Bit Mapped Graphics Mode (240 x 640 pixels) powered by separate 20Kb of fast display RAM.
* Two integrated Quad capacity floppy disks provide 720Kb of data storage.
* An 87 key Selectric style keyboard including 15 function keys and a 14 key numeric/cursor control keypad.
* Six I/O bus slots for serial or parallel I/O interfaces or NORTH STAR's Floating Point Board.

The ADVANTAGE comes complete with sample business graphics, self diagnostic software and graphics demo software. The ADVANTAGE is backed by NORTH STAR's G-BASIC/G-DOS and Graphics CP/M – each of which support both graphics and character mode.

To find out more about the Advantage and our extensive product range, contact us now for further details. Trade enquiries welcome.

ADVANTAGE is a trademark of North Star Computer Inc.
CP/M is a trademark of Digital Research Corp.

130

INTERAM

INTERAM DEALERS:

Bickerton Management Serv.
Shrewsbury (0743) 68167
Bromley Computer Consult.
Bromley 01-464 8080
C.B.A.S.S.
Luton (0582) 38792
Digital Devices Ltd.
Tunbridge Wells (0892) 37977
D.T. Systems
Norwich (0603) 27833
Fylde Microcomputer Serv.
Blackpool (0253 301306
Harris Brothers Ltd.
Newton Abbot (0626) 872404
Hill Briton Assoc. Ltd.
Edinburgh 031-225 7766
The Hardcore Software Co.
Hampstead 01-722 6436
Interface Engineering
Leeds (0532) 505494
Isis Systems Ltd.
Chiswick 01-995 8636
KBS Computer Services Ltd.
Liverpool 051-236 8333
KBS Computer Services Ltd.
Coventry (0203) 27226
KBS Computer Services Ltd.
Leeds (0532) 32046
Law Computer Services Ltd.
Mitcham 01-648 5641
Loveden Computer Serv. Ltd.
Grantham (0476) 82500
Microcomputer Business Sys.
Glossop (04574) 63819
Micro Facilities Ltd.
Hampton Hill 01-979 4546
Microtek (Ipswich) Ltd.
Ipswich (0473) 50152
Microtech Computer Serv.
Liverpool 051-236 2208/9
Senton Ltd.
Bristol (0272) 276132
Spot Computer Systems Ltd.
Doncaster (0302) 25159
S. Systems
Crawley (0293) 515201
Stag Terminals Ltd.
Teddington 01-977 7749
S.T. Commercial Sys. Ltd.
Ealing 01-840 1926.
Tantus Microsystems Ltd.
Putney 01-788 5054
Tynemouth Computer Serv.
Cramlington (0670) 712624
Video Vector Dynamics
Glasgow 041-226 3481/2

INTERAM COMPUTER SYSTEMS LTD.
46, Balham High Road,
London, SW12 9AQ.
Tel: 01-675 5325/6/7, Telex 925859

● Circle No. 181

Add mass storage to Apple and the sky's the limit . . .

. . . but we can keep the price right down to earth!

Apple and Mass Storage – the REAL* partnership

TECHNICAL DATA

- 5¼ inch Winchester disk drive
- 3, 6, 9 and 12 Mbyte capacities
- Compact design
- Variable configuration – hard disk or hard+ std. Apple 5¼" floppy drive
- Whisper quiet
- Apple support software for DOS 3.3, CP/M and Apple Pascal

REAL

Products and Systems available only from:-

Prices from £1800

COMPUTERFACTS (U.K) LTD

83 LALEHAM ROAD, STAINES, MIDDLESEX. TEL. STAINES 62501

● Circle No. 182

KONTRON:
LOOK TO TOMORROW

AND GET ON THE ROAD TO SUCCESS

Yet another dimension has been added to the immensely flexible PSI ψ 80!

With KOBUS, high speed, multiuser access, to a common database is now available over very long distances at a most affordable price bringing the results you want, where you want, **fast.**

At Kontron we support all our systems with a wide range of software and hardware tools; a multitasking operating system (CP/M* compatible); high level languages; applications and utilities; and a vast number of hardware expansion options.

KOBUS brings them all together into the most powerful and flexible of systems, in a unit that any businessman would like to see on his desk; to have a real impact on **your** business.

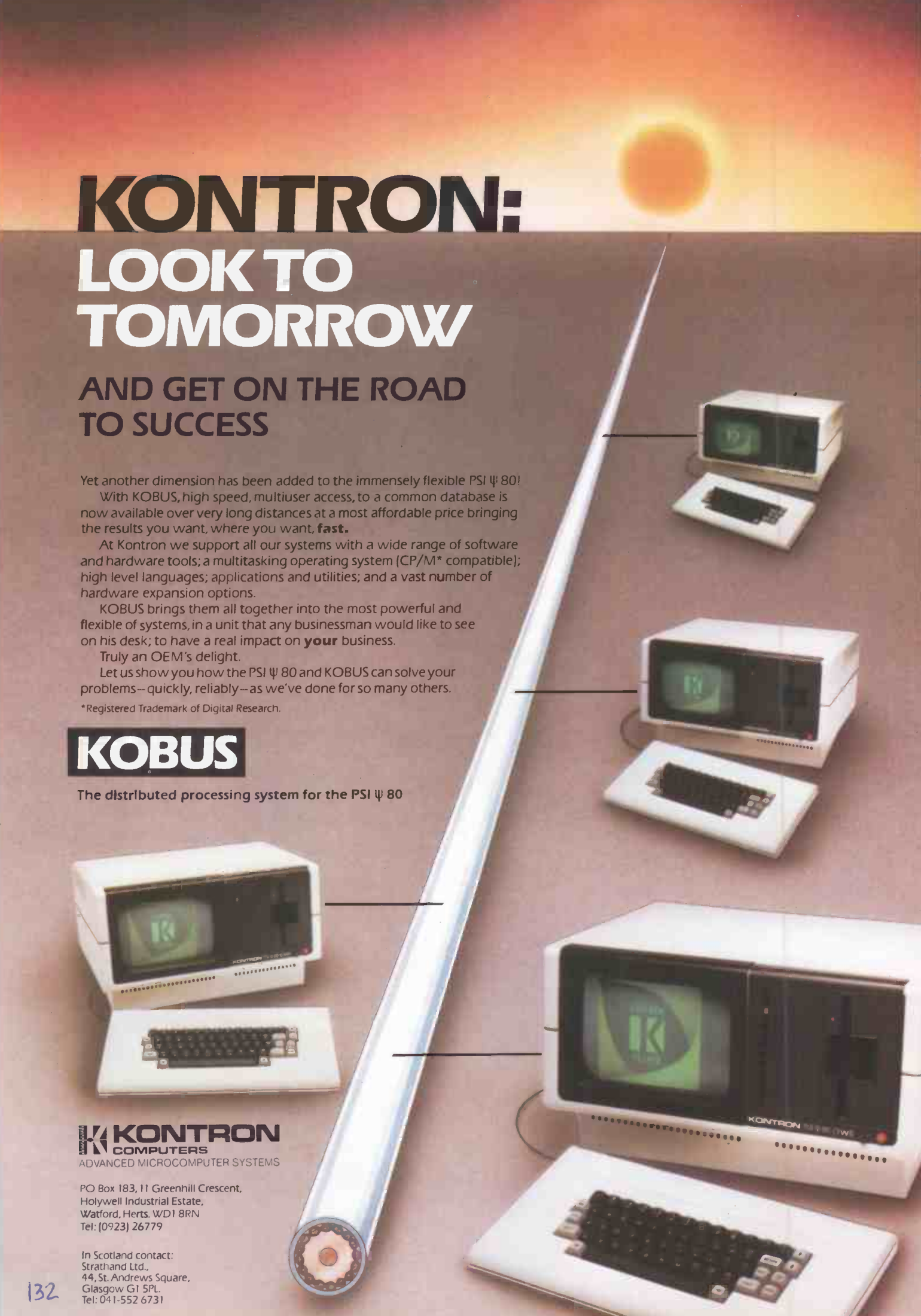
Truly an OEM's delight.

Let us show you how the PSI ψ 80 and KOBUS can solve your problems—quickly, reliably—as we've done for so many others.

*Registered Trademark of Digital Research.

KOBUS

The distributed processing system for the PSI ψ 80



KONTRON
COMPUTERS
ADVANCED MICROCOMPUTER SYSTEMS

PO Box 183, 11 Greenhill Crescent,
Holywell Industrial Estate,
Watford, Herts. WD1 8RN
Tel: (0923) 26779

In Scotland contact:
Strathand Ltd.,
44, St. Andrews Square,
Glasgow G1 5PL.
Tel: 041-552 6731

6502 SPECIAL

Determinant evaluator

THIS ROUTINE to evaluate any N-by-N determinant up to order 15 was written for the Acorn Atom with floating point by S Draper of Lincoln. Its recursive nature makes it considerably shorter than most other determinant-evaluation routines, and does not suffer from division-by-zero errors since there are no divisions within the routine.

The determinant to be evaluated should be in the top left of the 15-by-15 array. For example, with a second-order determinant row one would go into the first two elements of row one of the array, and row two into the first two elements of row two of the array. Since the Atom only supports one-dimensional arrays, the second row of the array starts at the 15th element of the array, and the element X,Y would be found at element 15*Y+X–16 of the array. Note that in Atom Basic the % operator means floating point not integer.

Determinant evaluator.

```
 10DIMPP15,FF15,SS15
 20FDIM%DD224,%EE15,%LL15
 95REM**SUBROUTINE d EVALUATES AN N BY N DETERMINANT IN THE**
 97REM**ARRAY %DD, AND RETURNS THE RESULT IN %D**
100dD=N
110aPP(N)=1;SS(N)=1;%EE(N)=0
120IFN>1 N=N-1;GOTOb
130FORI=1 TO D;FF(I)=0;NEXT
140FORI=D TO 2 STEP-1;C=0;L=0
150DO C=C+1
160cL=L+1;IF FF(L)=1 GOTOc
170UNTIL C=PP(I);FF(L)=1;NEXT
180FORI=1 TO D;IF FF(I)=0 J=I
190NEXT;%D=%DD(15%D-16+J);N=2;RETURN
195REM**RECURSIVE SUBROUTINE CALL OF SUBROUTINE a**
200bGOSUBa
210FORI=1 TO D;FF(I)=0;NEXT;FORI=D TO N STEP-1;C=0;L=0
220DO C=C+1
230eL=L+1;IF FF(L)=1 GOTOe
240UNTIL C=PP(I);FF(L)=1;NEXT
250%EE(N)=%EE(N)+SS(N)%D%DD(15%(D-N)+L-1)
260PP(N)=PP(N)+1;SS(N)=-SS(N);IFPP(N)>N;%D=%EE(N);N=N+1;RETURN
270N=N-1;GOTOb
```

Error-code remedy

THE UK101 has very awkward error messages caused by bit 7 of the second character being set writes Douglas Fyffe of Welling, Kent. A cure could be to reset bit 7 of all printed characters, but this would affect the CHR$ function.

This Basic program corrects the error messages with no other effect. Running it will enter machine code into page 2 of memory.

To reactivate it type

```
POKE538,40:POKE539,2
```

as one line.

Error-message remedy.

```
1    REM ROUTINE TO LOAD MC INTO RAM TO CORRECT
2    REM UK101 ERROR MESSAGES.
3    REM DOES NOT AFFECT CHR PRINT
4    REM
5    DATA132,174,134,173,186,188,4,1,192,162
6    DATA208,2,41,127,164,174,166,173,76
7    DATA0
8    REM MC CONVERTED TO DECIMAL FOR BASIC
10   X=512*40:REM START OF mc.
20   READA:IFA=0THEN40
30   POKEX,A:X=X+1:GOTO20
40   A=PEEK(538):POKEX,A:X=X+1
50   A=PEEK (539):POKEX,A
60   REM SETS UP PRINT POINTER
70   END
80   REM DONT CHANGE 40,50 AS THEY WILL NOT THEN
90   REM WORK DUE TO BASIC NOT SAVING POKE PTR.
99   REM AND PEEK OVERWRITING IT.
```

The program assumes the mono 2 monitor. For others, change the 538,9 numbers to those of the print vector of your monitor. AD to AE are used to save X and Y and are not normally free.

Though 61 to 64 are often quoted as free memory, they are actually used by Basic: 64 blanks printing when bit 7 is set, for instance.

D8 to FF are unused by Basic, so are free for use.

The RND function can be seeded by a negative argument.

Equation entry

WHEN WRITING a graph plotter or similar program for the Superboard II, it becomes necessary to input an equation for plotting, writes Robert Schifreen of Edgware, Middlesex. This is usually done by asking the user to break in and add a line of the form

```
10 DEF FNA(X)=(4*X)+7
```

and restart the program from line 10. However, the following segment of Basic will accept an equation as a string and Poke it directly into a statement. To use it, the start of the program must be at line 10 and must be exactly as follows:

```
10 DEF FNA(T)=++++++++(50 OF
   THESE)+++1-1
```

The T shows that the equation is in terms of T, and this subscript is asked for by the program. Then type in the equation. The equation is Poked to replace the corresponding number of + signs; the remaining + signs simply add and subtract 1 from the total, making no difference at all.

It is not possible to add 0, as this interferes with the end-of-line null used by Basic. The + signs are needed because pointers need to be set if a line length is altered, otherwise memory will be corrupted. The comparisons are needed because some characters are represented differently in a string and in an equation.

The program will not recognise any standard Basic functions: there are too many of them, and they will be tokenised by Basic. If you are going to use any functions frequently, find out their token by Peeking, and add an appropriate line to the program.

If typing programs that Poke memory, ensure that they are saved before running.

Equation entry.

```
10 DEF FNA(T)=++++++++++++++++++++++++++++++++++++++++++++++++++1-1
100 PRINT"ENTER EQUATION..."
110 PRINT"X=";
120 INPUT EQ$
130 INPUT"IN TERMS OF ";Z$
140 POKE 778,ASC(Z$)
145 IF LEN(EQ$))50 THEN PRINT"TOO LONG":STOP
150 FORC=1 TO LEN(EQ$)
160 A$=MID$(EQ$,C,1)
170 CC=ASC(A$)
175 R=780+C
180 IF CC)47 AND CC(58 THEN POKE R,CC
190 IF CC)64 AND CC(91 THEN POKE R,CC
200 IF CC=46           THEN POKE R,CC
210 IF CC=42 OR CC=43 OR CC=45 OR CC=47 THEN 300
220 IF CC=40 OR CC=41 THEN  POKE R,CC
230 GOTO 400
300 IF CC=43 THEN POKE R,163
310 IF CC=45 THEN POKE R,164
320 IF CC=47 THEN POKE R,166
330 IF CC=42 THEN POKE R,165
400 NEXT C
```

◀ ● Circle No. 183

Bloodstream

YOU ARE a doctor in the year 2112. Your patient is dying of cancer and there is no drug that can help him. He has only one chance, but you will have to risk your own life if you want to save him.

This is the scene set by Greg Hopkins of Reigate, Surrey, in Bloodstream, a fast-action graphics game written for use on a new-ROM Pet. The Basic section of the program prints instructions and comments and sets up the screen, while the machine code actually plays the game.

The miniaturised player and ship are injected into the patient's bloodstream, where they must try to destory the cancer cells, while evading collision with cancer and antibody cells. The game ends either when all the cancer cells have been obliterated or when the ship has been hit three times.

If at first you find the program too difficult to beat, you can give yourself more shields by changing the threes in lines 280 and 510 to sixes, and the 300 in line 430 to 150. If you master the game you can increase the number of enemies by lengthening the For loop in line 130 and changing the sixes in lines 380, 430 and 480 accordingly.

To save memory space, the data statements are over-written by the machine-code program. You must, therefore, type in the program exactly as it is shown in the listing, including all Rems, and you must save it before you run it.

```
100 REM *** FANTASTIC VOYAGE ***
110 REM A PROGRAM BY GREG HOPKINS
120 DATA77,66,78,67,43,67,78,66,77:GOTO580
130 FORX=1TO3:POKE32768+INT(RND(0)*240+25),35
140 POKE32768+INT(RND(0)*240+25),43
150 POKE33528+INT(RND(0)*240),35
160 POKE33528+INT(RND(0)*240),43:NEXT
170 POKE4397,172:SYS4112
180 P8=PEEK(178):P7=PEEK(177)
190 SYS4794:IFPEEK(185)=0THEN320
200 P=P8*256+P7:POKE177,P7:POKE178,P8
210 POKE59467,16:POKE59466,16
220 FORX=0TO8:READA:POKEP+X+INT(X/3)*37,A:NEXT
230 FORX=0TO255:POKE59464,X:NEXT
240 POKE59464,150
250 FORX=0TO8:POKEP+X+INT(X/3)*37,32:NEXT:RESTORE
260 POKE59467,0
270 D=D+1:PRINT"■YOU JUST LOST SHIELD:"D
280 FORX=1TO800:NEXT:IFD=3THEN310
290 PRINT"■                    "
300 POKE4397,172:SYS4120:GOTO180
310 SYS4794
320 C=PEEK(185):G=PEEK(186)
330 IFC=0THEN430
340 FORX=1TO10:GETA$:NEXT
350 PRINT"□■YOUR MISSION HAS FAILED !"
360 PRINT"■BECAUSE OF YOUR INCOMPETENCE THE PATIENT
370 PRINT"WILL DIE OF CANCER.
380 PRINT"■■■YOU SCORE ONLY"6-C"POINTS"
390 PRINT"IF IT'S ANY CONSOLATION, YOU DIED JUST"
400 PRINT"IN TIME TO AVOID BEING DEMOTED TO "
410 PRINT"LAVATORY ATTENDANT."
420 END
430 S=1000-300*D-15*(6-G)
440 PRINT"□■CONGRATULATIONS !!!"
450 PRINT"■YOU CURED THE CANCER AND THE PATIENT MAY";
460 PRINT"RECOVER,
470 PRINT"YOU LOST"D"SHIELDS."
480 PRINT"AND YOU KILLED"6-G"ANTIBODIES BY MISTAKE."
490 PRINT"SO YOU SCORE"S"POINTS"
500 FORX=1TO10:GETA$:NEXT
510 IFD<>3THEN550
520 PRINT"■■YOU DIDN'T DIE IN VAIN, BUT IN THE MOST"
530 PRINT"NOBLE WAY POSSIBLE - IN SAVING ANOTHER
540 PRINT"MAN'S LIFE.":END
550 INPUT"WILL YOU HELP TO SAVE ANOTHER LIFE";A$
560 IFLEFT$(A$,1)="Y"THENRUN
570 PRINT"■■GOODBYE...":END
580 PRINT"□          FANTASTIC VOYAGE"
590 PRINT"                    "
600 PRINT"■■■YOUR PATIENT IS DYING OF CANCER."
610 PRINT"YOUR TASK IS, HAVING BEEN SHRUNK TO"
620 PRINT"INFINITESIMAL SIZE, TO COMBAT ON A"
630 PRINT"MONO-CELLULAR BASIS THE ANTIGEN CELLS
640 PRINT"REPRESENTED BY THE #'S ON YOUR SCREEN.
650 PRINT"ALL THESE CELLS MUST BE DESTROYED IF
660 PRINT"THE PATIENT IS TO SURVIVE."
670 PRINT"    YOUR TASK IS MADE MORE DIFFICULT BY
680 PRINT"THE PRESENCE OF ANTIBODIES IN THE"
690 PRINT"BLOODSTREAM. NOT ONLY DO YOU HAVE TO"
700 PRINT"AVOID DESTROYING THEM (IF YOU DO IT "
710 PRINT"WILL MAKE THE PATIENT MORE SUSCEPTIBLE"
720 PRINT"TO INFECTION) BUT ALSO IF THEY HIT YOU!"
730 PRINT"THEY CAN DESTROY YOUR SHIP. YOUR SHIP"
740 PRINT"HAS BEEN PROVIDED WITH THREE SHIELDS"
750 PRINT"TO PREVENT THIS EVENTUALITY BUT AFTER"
760 PRINT"THEY'RE GONE THE PATIENTS BLOOD-PRESSURE"
770 PRINT"WILL CRUSH YOUR SHIP (AND YOU IN IT).
780 PRINT"ANTIBODIES LOOK LIKE THIS - '+'."
790 PRINT"P.S. CANCER-COLLISIONS KILL YOU TOO!
800 IFPEEK(4112)<>169THEN1020
810 PRINT"              PRESS A KEY"
820 GETA$:IFA$=""THEN820
825 GOTO940
830 PRINT"□          ■SHIP'S CONTROLS"
840 PRINT"■■■■■TURN LEFT  -   '!' KEY"
850 PRINT"■■■■■TURN RIGHT -   '#' KEY"
860 PRINT"■■■■■FIRE       -   'HOME' KEY
870 PRINT"■■■■■MOVE       -   'LEFT/RIGHT' KEY
890 PRINT"■■■■■DO YOU WANT CONTINUAL MOTION"
900 INPUT"(PRESS MOVE  KEY TO STOP) ";M$
910 POKE4153,208
920 IFLEFT$(M$,1)="Y"THENPOKE4153,16
930 PRINT"□                          ":GOTO130
940 PRINTSPC(14)"REMEMBER:"
950 PRINTSPC(7)"■■■■YOUR SHIP          =  ●*
960 PRINTSPC(7)"■■■■A CANCER CELL      =  #
970 PRINTSPC(7)"■■■■AN ANTIBODY        =  +
980 PRINT"■■■TURN ON YOUR SOUND BOX IF YOU HAVE ONE."
990 PRINT"■■■■■■■■■■■■■■■■PRESS A KEY"
1000 GETA$:IFA$=""THEN1000
1010 GOTO830
1020 FORJ=1TO9:READK:NEXT
1030 FORJ=4112TO4959:READK:POKEJ,K:NEXT
1040 RESTORE:GOTO810
1050 REM*** DATA STATEMENTS ***
1060 REM*** FOR MACHINE CODE PROGRAM ***
1070 DATA169,129,133,178,169
1080 DATA203,133,177,160,41,169,81,145,177,200
1090 DATA169,42,145,177,162,3,234,234,234,234
1100 DATA234,169,0,141,16,232,173,18,232,141
1110 DATA89,19,73,255,41,128,208,117,173,94
1120 DATA19,77,89,19,45,94,19,141,95,19
1130 DATA173,89,19,41,1,208,34,173,89,19
1140 DATA41,2,208,59,32,240,248,173,95,19
1150 DATA41,64,240,3,76,64,17,173,89,19
1160 DATA141,94,19,76,16,17,170,170,170,170
1170 DATA170,188,80,19,169,32,145,177,232,224
1180 DATA8,208,2,162,0,188,80,19,169,42
1190 DATA145,177,76,78,16,170,170,170,170,170
1200 DATA170,170,170,188,80,19,169,32,145,177
1210 DATA202,224,255,208,2,162,7,188,80,19
1220 DATA169,42,145,177,76,88,16,170,170,170
1230 DATA170,170,170,170,170,160,41,169,32,145
1240 DATA177,188,80,19,140,88,19,145,177,169
1250 DATA4,141,90,19,141,91,19,32,208,16
1260 DATA76,59,16,170,170,170,170,24,216,165
1270 DATA177,109,88,19,133,177,165,178,105,0
1280 DATA133,178,24,216,165,177,233,40,133,177
1290 DATA165,178,233,0,133,178,201,132,208,4
1300 DATA169,128,133,178,201,127,208,4,169,131
1310 DATA133,178,169,81,160,41,145,177,169,42
1320 DATA188,80,19,145,177,96,170,170,170,170
1330 DATA170,142,92,19,140,93,19,162,0,160
1340 DATA0,200,192,2,208,251,232,224,2,208
1350 DATA244,234,234,234,169,0,168,32,0,18
1360 DATA96,93,19,174,92,19,76,42,16,170
1370 DATA170,170,170,170,170,170,170,170,170,169
1380 DATA0,141,100,19,24,188,80,19,152,101
1390 DATA177,133,177,165,178,105,0,133,178,56
1400 DATA165,177,233,41,133,177,165,178,233,0
1410 DATA133,178,177,177,201,32,240,5,169,11
1420 DATA141,100,19,76,192,17,173,100,19,201
1430 DATA12,240,10,169,90,145,177,76,69,17
```

```
1440 DATA234,234,234,76,164,17,56,165,177,253
1450 DATA80,19,133,177,165,178,233,0,133,178
1460 DATA24,165,177,105,41,133,177,165,178,105
1470 DATA0,133,178,177,177,201,90,208,7,169
1480 DATA32,145,177,76,131,17,169,0,141,75
1490 DATA232,76,98,16,170,170,170,170,170,170
1500 DATA170,170,170,170,170,170,170,238,100,19
1510 DATA165,178,201,127,208,5,169,12,141,100
1520 DATA19,169,16,141,75,232,169,32,141,74
1530 DATA232,169,104,141,72,232,142,92,19,140
1540 DATA93,19,162,0,160,0,200,192,37,208
1550 DATA251,232,224,37,208,244,174,92,19,172
1560 DATA93,19,76,111,17,170,170,170,170,170
1570 DATA170,169,128,133,186,169,0,133,185,141
1580 DATA99,19,177,185,201,35,240,63,201,43
1590 DATA240,62,230,185,208,242,230,186,165,186
1600 DATA201,132,208,234,169,128,133,186,169,0
1610 DATA133,185,177,185,201,36,208,4,169,35
1620 DATA145,185,201,44,208,4,169,43,145,185
1630 DATA230,185,208,234,230,186,165,186,201,132
1640 DATA208,226,173,99,19,208,3,76,172,18
1650 DATA96,238,99,19,141,98,19,32,0,19
1660 DATA24,165,185,109,96,19,133,179,165,186
1670 DATA105,0,133,180,56,165,179,233,41,133
1680 DATA179,165,180,233,0,133,180,201,132,208
1690 DATA4,169,128,133,180,201,128,16,4,169
1700 DATA131,133,180,169,32,145,185,238,98,19
1710 DATA177,179,201,81,240,31,201,42,240,27
1720 DATA201,32,208,8,173,98,19,145,179,76
1730 DATA11,18,206,98,19,76,103,18,234,234
1740 DATA234,234,234,169,254,133,185,169,96,141
1750 DATA45,17,96,170,170,170,170,169,128,133
1760 DATA178,169,0,133,177,168,133,185,133,186
1770 DATA177,177,201,35,208,2,230,185,201,36
1780 DATA240,27,234,234,201,43,208,2,230,186
1790 DATA201,44,208,2,230,186,230,177,208,226
1800 DATA230,178,165,178,201,132,208,218,96,169
1810 DATA35,145,177,76,205,18,170,170,170,170
1820 DATA170,170,170,170,170,170,170,169,41,141
1830 DATA96,19,234,234,234,169,40,141,97,19
1840 DATA32,32,19,169,1,141,97,19,234,234
1850 DATA234,32,32,19,96,234,234,234,234,32
1860 DATA127,223,165,138,201,255,16,11,24,173
1870 DATA96,19,109,97,19,141,96,19,96,201
1880 DATA255,16,1,96,56,173,96,19,237,97
1890 DATA19,141,96,19,96,170,170,170,170,170
1900 DATA170,170,170,170,170,170,170,0,1,2
1910 DATA42,82,81,80,40,82,127,4,4,4
1920 DATA82,127,0
READY.
```

Mailing list

MAILING LIST is intended as part of a suite which handles business data. It will also be very useful for clubs and societies for membership records, suggests M J Valentine of Rotherham, South Yorkshire.

The program is designed to handle 10 lines of data up to 24 bytes long, to be ordered by record number. Any character pattern on any line may be searched for, and various print formats are available as required. Lines 1 to 9 are intended for record data, while line 10 is intended for access, e.g.:

Smith a 1/10/81 aug

Where data could be subscription renewal dates, or coding that a particular function job had been done on that record, e.g., by another program.

The program is written in Commodore Basic 4.0 and requires a disc-DOS 2.1 or 2.5. The printer output is to device 4, so any suitable printer, such as the Commodore 3022, could be used.

The program uses Commodore's relative-file system. Record# positions the DOS record pointer prior to Print# or Input#. The variables DS and DS$ contain the disc-status data.

The following are used:

Backup-shifted B — creates a back-up copy of drive 0 in drive 1.

End clears the screen and displays both disc directories prior to ending the program run.

Drive targets either the program or the disc drive. Drive 0 is set on start-up. The disc identity is read and the first record from the file is displayed.

File Name is used to access a file when several files exist on the same disc. Normally only one relative file is on the disc and may occupy all available blocks.

Amend allows retyping of any line of the record displayed. Keys 1 to 9 will display the appropriate line, while 0, a or Return will access line 10. Once the line has been typed, the record is updated. To clear a record use Scratch, and New to enter a complete record. An entry must have at least one character to ensure a disc crash does not result. A single space is not allowed, neither are ", " "; " etc. which are treated by the Basic input statement as field terminators.

Record causes the specified record to be displayed onto the screen, providing it exists, otherwise the DOS error channel is displayed.

< & > keys cause the next record down — or next record up to be displayed and are used for thumbing through each record.

New allows retyping of all 10 lines in a similar manner to Amend. The record is updated on completion of line 10.

The Scratch command — shifted S — forces a Record Vacant flag. All lines contain a # after a Scratch, the # allows a search to be made for a Vacant record via Hunt. To expand or create a relative file, providing the file name and drive have been previously set up, the highest record is requested via the record command. A record-not-present error will result. If this record is scratched then this record is written to disc. The DOS will then allocate space to all the intermediate records, filling then with graphics CHR$ 255. If this character is deleted in a record read, then the Scratch function is automatically forced.

The Hunt command will first request the start and finish record for examination; low to high will be examined sequentially. The matching line will then be requested. Lines from 169 may be specified, but any other key will default to line 10.

At the same time as the record is read during a sweep, the matching line is retained in the CBM memory. It will remain so until another access line is specified or the drive is changed. This feature allows rapid examination for a match in memory, saving on disc-access time. If the record access line is not in memory the record is accessed and memory updated. The pattern-matching rules are similar to those of the Commodore DOS:

? matches any character

* matches all subsequent characters

For example the command ?m?th* will find

SMITH

SMITHERONE

SMYTH

but not

scmitt and * will find all records.

To find the 15th character, X on the access line try

??????????????X*

◄— 14*'?' —►

If a match is found it is displayed on the screen. A print option appears, allowing one copy of the appropriate format to be printed. If a print is not required then the search proceeds by default.

To create a memory image of all access lines will take about four minutes on a 4040 disc. This function is caused by using an unlikely match such as $* as the pattern match.

The Card and Mail Print function is intended to print either a record-card label — e.g., as a stick-on label for a customer's personal file — or a mailing label, providing the approprate stationery is loaded into the printer. The Printout option applies only to the record displayed where only one printout is produced.

The Scan option behaves like Hunt, with a printout resulting from a match. An advice of print will be placed on the specified position in line 10. This is intended to show a particular operation has been performed, e.g., a catalogue has been sent. The advice character and position may be specified prior to printout.

Selection of position 25 will abort this function. As to which character is used for what function depends on the user. It could be for use by another program.

The print function is as Card and Mail print, but the user may specify to print or ignore lines 3 to 9. If the line is ignored then a blank line is printed so as to maintain registration on any labels, etc. This function is intended for listing where sensitive areas of data are required to be omitted. Of course, any intending user

(continued on next page)

(continued from previous page)

may modify these routines to their requirements.

During typing of data the normal Basic input is not used. Instead an input subroutine only allows entry of characters which will not interfere with the DOS operation. To this end, entry of a null string or all-spaces are disallowed as they would a crash the program or lose the registration.

If no entry is required in a particular field, then a dot or other appropriate filler character should be used. During any input of data the ! key will abort the current operation. During a scan, holding down the Shift will allow an abort option.

Originally the printout was on self-adhesive single-web labels obtained from Ladas Printers, Staveley, Chesterfield. Intending users should adapt the program to their own requirements as required.

The program has been used for many months on a Basic 4 machine. When it was tried on a Basic 3 machine, with a Disk-o-Pro ROM fitted to allow Basic 4 commands to be used, the following problems were noted.

- If a record contained a null string or two consecutive carriage-returns, CHR$ 13 then the system crashed.
- The system was slower in operation.
- The function
  left$(ds$+c$,30)
  intended to clear garbage from previous error fields did not work.

Before setting-up, a relative file should be created to avoid any of these problems using the set-up routine:

```
10 DOPEN#1, "MAILING DATA", D1, L250
20 FORQ=ITO (required size): RECORD#1, (Q)
30 Q$="": FORX = ITO10: Q$ = Q$ + "#" + CHR$(13): NEXT: PRINT #1, Q$: NEXT
40 DCLOSE
```

I am prepared to copy this program to 4040 disc format for £10 per copy, if requested.

```
1000 REM   FOR PET BASIC 4 AND DOS 2.1
1010 REM   ALLOWS TO 650 RECORDS EACH OF
1020 REM   10*24 BYTES AS MAILING DATA
1030 REM   SEARCH FACILITIES FOR PATTERN
1040 REM   MATCHING TO ANY LINE ARE INCLUDED
1050 REM   THREE PRINT ROUTINES ALLOW
1060 REM   ADDRESS LABEL ,RECORD CARD,OR
1070 REM   USER DEFINABLE LINES TO BE
1080 REM   PRINTED
1090 REM   OUTPUT IS TO A PET 3022 PRINTER
1100 REM  M  VALENTINE  16/6/81
1110 REM  "MAILING LIST"
1120 DIMN$(650),A$(10),A(10):F$="MAILING DATA":R=1:F=1:ML=10:L=10
1130 C$="                                        "
1140 PRINT"■MAILING LIST G4ANP":FORI=1TO10:A$(I)="?":NEXT
1150 REM  GET DISK ID
1160 OPEN15,8,15
1170 PRINT#15,"U:":PRINT#15,"I"Q$:GOSUB1290
1180 OPEN2,8,2,"#":ID$="":PRINT#15,"U1":"2:D;18;0:PRINT#15,"B-P"2;144
1190 FORP=1TO20:GET#2,Q$:ID$=ID$+Q$:NEXT
1200 GOTO1240
1210 REM  FORMAT BACKUP DISK
1220 PRINT"FORMAT DRIVE 1 "ID$; PRINT#15,"N1 "LEFT$(ID$,18)","RIGHT$(ID$,2):GOS
UB1290
1230 PRINT"COPY 0 TO 1 ";:PRINT#15,"C1=0":GOSUB1290:DIRECTORY GOSUB1260
1240 CLOSE2:CLOSE15:GOTO1310
1250 REM  GET A CHARACTER
1260 GET@$:IF@$=""THEN1260
1270 IFQ$="!"THEN1400
1280 Q=VAL(Q$):RETURN
1290 PRINT" = "LEFT$(DS$+C$,30)
1300 RETURN
1310 PRINT"■":GOSUB1560:GOSUB1900:GOSUB1780
1320 POKE59468,14
1330 FU$="":SW$="       ":IFL=0THENL=10
1340 IFR>650THENR=650
1350 GOSUB1640:GOSUB2070
1360 GOSUB1850
1370 GOSUB1260
1380 PF$=Q$:FU$=Q$
1390 REM  SELECT FUNCTION
1400 IFQ$="!"THENPRINT"■BACKUP DESTINATION DRIVE 1":GOSUB1260:OPEN15,8,15:GOTO1
220
1410 IFQ$="E"THENPRINT"■":DIRECTORYD(D) END
1420 IFQ$="D"THENPRINT"DRIVE ? ";:GOSUB1260:PRINT@$;:D=VAL(Q$):GOTO1160
1430 IFQ$="F"THENPRINT"F =":Z$=F$:GOSUB2130:F$=Z$ GOTO1330
1440 IFQ$="A"THENPRINT"LINE ? ";:GOSUB1260:PRINT@$; L=VAL(Q$):GOTO2380
1450 IFQ$=">"THENR=R+1:GOSUB1780:GOTO1330
1460 IFQ$="P"ORQ$="M"ORQ$="N"ORQ$="C"THEN2420
1470 IFQ$="R"THENPRINT"■":PRINT:PF$="R■":GOSUB2130:R=VAL(Z$):GOSUB1780:GOTO1330
1480 IFQ$="("ANDR>1THENR=R-1:GOSUB1780:GOTO1330
1490 IFQ$="N"THEN1530
1500 IFQ$="@"THENPRINT"SCRATCH ? Y/N"; GOSUB1260:IFQ$="Y"THENGOSUB1520
1510 GOTO1330
1520 FORQ=2TO10:A$(Q)="■":NEXT:A$(1)="### ■RECORD VACANT■ ###" GOSUB1720 RETURN
1530 GOSUB2300:FORE=1TO10:PRINT:PF$="N"+CHR$(48+E)+"  ":A$(E)="■"+A$(E):GOSUB18
50
1540 Z$="":GOSUB2220:A$(E)=Z$:GOSUB1850:NEXT:GOSUB1720:GOTO1330
1550 REM  PRINT FRAME
1560 PRINTTAB(1)"■■■
```

NOW YOU HAVE AN APPLE MICROCOMPUTER YOU'LL NEED

OMNIS®

NEW

All you've ever wished for in an information management system.

OMNIS sets new standards in database programs and levels of performance that you never believed were possible on a microcomputer.

- **OMNIS** is written in UCSD Pascal+, this means a better structured, faster running set of programs than could ever be possible using Basic — We believe that UCSD Pascal+ is the best microcomputer language available — OMNIS proves it —
- **OMNIS** is structured around powerful file handling modules. These modules give you the flexibility to store and retrieve your information in the way that you want. Full multi-key indexed access is available to all your database files, you say what you want — OMNIS does the rest.
- **OMNIS** provides you with a versatile report generating module that enables you to define your own reports, lists, mailing labels etc.
- **OMNIS** has unparalleled search facilities to allow you to be selective. Those hours of fruitless searching through rows of card indexes becomes a thing of the past.
- **OMNIS** lets you design your own screen layouts for data entry and inspection — you may have up to 10 screens per file.

OMNIS has an application waiting for it in every business, school and laboratory and workshop. Wherever information needs to be stored and retrieved. OMNIS is available for both APPLE II and APPLE ///. We can also supply OMNIS for use on APPLE microcomputer networks (yes, with true multi-user record locking). Trade enquiries welcome.

All registered users of OMNIS will be sent **FREE BACKUP** disc and you will be kept informed of all updates and upgrades. Free help will be given to all registered users via an OMNIS hotline.

OMNIS — All you ever wanted

APPLE II* version - £174.00 (incl VAT & pp)
APPLE ///* version - £225.75 (incl VAT & pp)

BLYTH COMPUTERS LIMITED
Wenhaston, Halesworth, Suffolk
IP19 9DH

050 270 565

24 hour phone service

*trademarks of APPLE Computer Inc
+ trademark of the Regents of the University of California, San Diego.

We welcome Access | BARCLAYCARD VISA

® Registered Trade Mark

To: Blyth Computers Ltd., Wenhaston, Halesworth, Suffolk IP19 9DH
PLEASE SEND ME ☐ **APPLE II VERSION** ☐ **APPLE /// VERSION**
Cheque enclosed or please charge my Access*/Barclaycard no.
*Delete as applicable
Name (Block Capitals)
Address
Tel. No

PC 3

● Circle No. 184

SOFTWARE FOR CP/M®

HIGH QUALITY SOFTWARE – WITH HIGH QUALITY SERVICE

NEW THE FORMULA £300. Application Builder and Reporter. SPELL STAR £125. Option for Wordstar. SUPER CALC £165. Spread Sheet financial planning.

WORDSTAR - Professional word processing software. On-screen formatting, wordwrap, pagination, line and character count on view. Micro-justification on dalsy-wheel printer. Search and replace. Block/paragraph manipulation. External file read/write. Background printing during editing etc.	£250
MAIL–MERGE - Powerful Wordstar enhancement for file merging and document personalisation.	£65
DATASTAR Screen orientated system for Data Entry, Retrieval and Updating.	£175
SUPERSORT - Sort, merge and selection program.	£125
CONFIGURABLE BUSINESS SYSTEM (CBS) - Unique information management system with user definable files, powerful report generator, menu-driven for ease of use. No programming experience necessary!	£225
ACCOUNTING PACKAGES by Median - Tec: PAYROLL, SALES, PURCHASE, NOMINAL Speclally developed by UK software house to exacting specifications. Written In Microsoft Basic each package may be customised by end user, all are widely used. Ledgers are open item. Payroll caters for weekly and monthly pay.	£500 each
PROJECT COST CONTROL/JOB ACCOUNTING - A comprehensive set of programs to monitor budgets, account for expenditure and project completion etc. Ideally suited for contractors. Written in CBASIC-2.	£150
STATISTICS PACKAGE - Over 25 routines including Regression & ANOVA	£100
MATHS PACKAGE - Over 40 easily used routines.	£100
IBM - CP/M COMPATIBILITY - Powerful utility to transfer data to/from IBM machines in standard disk format.	£110
MICROSOFT BASIC INTERPRETER	£155
MICROSOFT BASIC COMPILER	£195
MICROSOFT FORTRAN COMPILER	£205
MICROSOFT COBOL	£310
MAGSAM - Versatile easy to use Keyed File Management System for Microsoft Basic or CBASIC.	£130
CIS - COBOL - ANSI' 74 implementation to full level 1 standard. Supports random, indexed and sequential files, features for conversational working, screen control, interactive debugging, program segmentation etc.	£425
FORMS-2 - Automatic COBOL code generator for screen formats.	£100
PASCAL-Z	£235
STRUCTURED BASIC - Relocatable compiler	£160
CBASIC-2 - Extended Disk Basic pseudo compiler and run-time interpreter.	£75
SELECTOR III - C2 - Information management system written in CBASIC-2	£185
SELECTOR IV - Upward compatible version of III with enhanced reporting.	£300
BSTAM - Telecomms facility for exchanging files between CP/M computers.	£100
ASCOM - Facility for communicating with other computers.	£95
TRANSFER - CP/M to CP/M file exchange - telecomms source code	£125
MACRO 80 - Macro Assembler	£99
CP/M 2.2 - Standard Version 8" Single Density.	£99

Please contact us for availability of other products
All orders must be PREPAID. Add £1 per item P & P (Minimum £2.00) and VAT
CP/M is trade mark of Digital Research

TELESYSTEMS LTD

P.O. Box 12, GREAT MISSENDEN, BUCKS, HP16 9DD
Telephone (02406) 5314

● Circle No. 185

THE TRANSTEC 1200 VIDEO MONITOR.

At last, a top quality green screen 12" video monitor at a really competitive price.

The Transtec 1200 has a composite video input, compatible with all micro computers and the screen gives a crisp read-out of a full 80 columns.

The unit is housed in a durable plastic cabinet with controls neatly concealed behind a hinged front-access panel.

Why pay more? Send the coupon today for full specification or better still, call us direct in Bristol.

transtec

13A Small Street, Bristol W.1.
Tel: 0272 277462.
Lisburn Road, Belfast.
Tel: 24009.
35 Pearse Street, Dublin 2.
Tel: 713049.
I.D.A. Complex, 22 Macken Street, Dublin 2.
Tel: 713049.

DEALERS WELCOME. PRIVATE LABELLING AVAILABLE. ALSO AVAILABLE UNCASED.

SEND £115 (VAT CARRIAGE INCL.) FOR IMMED. DELIVERY.

I like the Transtec 1200 price — send me more data — fast.

Name _____

Company _____

Position _____

PC 3/82

JUST £99 COMPLETE.*

* + VAT, postage and packing not included

RSONAL CO

LONELY Genie I Microcomputer, early eighties, with large peripheral family but currently unattached, would like to meet interesting, attractively packaged software, Genie or Tandy specification, for programming, problem solving, entertainment and long-lasting friendship. Reply in confidence. Box No RS232.

ANSWERING MACHINES

Office certified

ingenious ...but lonely!

Buying your first Genie I microcomputer is just the start of a long and enthralling adventure, for it won't be long before you will want to expand your system with some of the wide range of peripherals which make up the complete Genie System.

Firstly there is the **Expansion Box,** which immediately expands your Genie's capacity to 32K RAM, and up to 48K RAM if required. It can be connected to 4 disk drives, a printer, RS232 interface or S100 cards.

Then there is the **Printer,** a compact unit with 80 column, 5 x 7 matrix print-out, which connects to your Genie through the Expander, or via the Parallel Printer Interface.

The **Disk Drive** gives you greater storage capacity and full random access file handling, with the option of double-density through a special adapter.
New Dual Disk Drive now available!

Finally, there is Genie's very own **12" Monitor,** a must if you want to let the rest of the family watch their T.V. in peace!
Available in B & W or green tube.

The supreme advantage of the Genie I system is its compatibility with the TRS 80, which means that literally 1000's of pre-recorded programs are already available, just waiting to be plugged into your Genie!

The recent improvements in the Genie system, including Extended Basic, sound unit and machine language monitor, make it the ideal system for the committed hobbyist, and an excellent and easy-to-use educational tool.

SPECIAL TECHNICAL GENIE HOT – LINE ON 0629 4995

for all your technical advice and service back-up on any aspect of the Genie system direct from the experts!

Please send me FREE, 16 page colour brochure on the Genie Computer System. I enclose 25p postage.

Name _____

Address _____

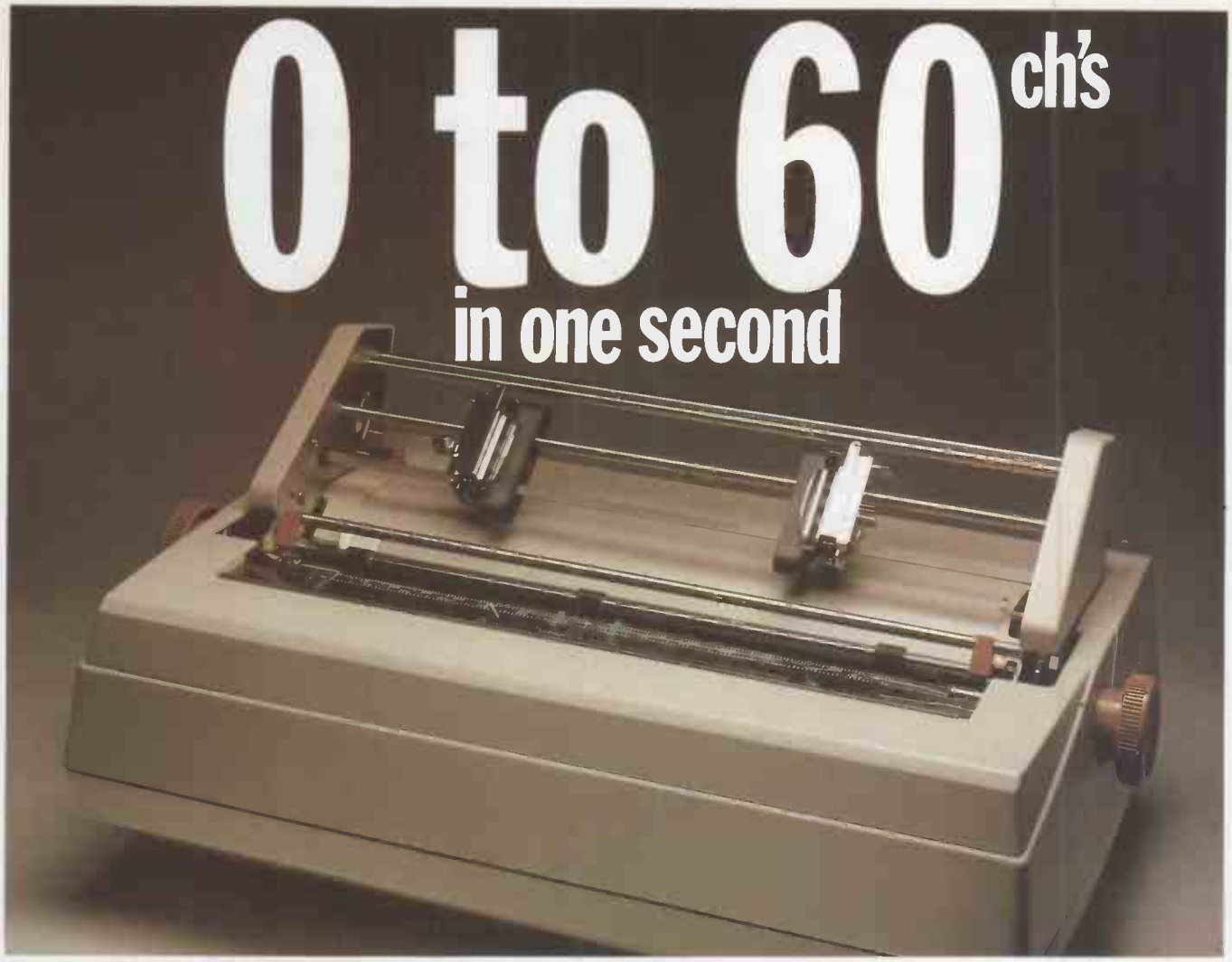
_____

Telephone _____ PC·82

LOWE electronics

Chesterfield Road,
Matlock,
Derbyshire DE4 5LE.
Telephone: 0629 4995.
Telex: 377482 Lowlec G.

0 to 60 chs in one second



THE RICOH 1600S

If it's high performance you're looking for, the Ricoh 1600S is for you, offering an amazing 60 characters in just 1 second. An updated version of the tried-and-tested 1600, the new S model has been re-designed and fitted with all sorts of extras. Yet one thing hasn't changed — the price, making the 1600S cheaper than any equivalent model on the market. This superb performer incorporates the Z80 microprocessor, auto bidirectional printing and look-ahead logic, increasing speed and efficiency. Other capabilities include proportional spacing, graph plotting and word processing enhancements. The printer includes a standard centronics interface, and RS232 and IEEE options are available.

The Ricoh 1600S is available only from Micropute and their authorised dealers, all backed up with a nationwide service network. If you're interested in the 1600S either as a customer or as a dealer, send the coupon now.

"Picture shows 1600s fitted with tractor feed option"

Please send me details on the Ricoh 1600S.

Name

Position

Company

Address

Tel. No

RICOH 1600S THE PERFORMANCE HAS RISEN — THE PRICE HASN'T

FEATURES	COMPETITORS				
	DIABLO 630	QUME SPRINT 5	SPIN-WRITER	RICOH RP.1600 (10 DATA)	**RICOH RP.1600S**
PRINT SPEED (CPS)	40	45/55	55	60	**60**
PRINT ELEMENT	DAISY-WHEEL	DAISY-WHEEL	THIMBLE	DOUBLE DAISY-WHEEL	**DOUBLE DAISY-WHEEL**
AUTO BIDIRECTIONAL	Yes	No	No	No	**Yes**
AUTO LOGIC SEEKING	Yes	No	Yes	No	**Yes**
PROPORTIONAL PRINT CAPABILITY	Yes	Yes	Yes	No	**Yes**
EXTENDED CHARACTER SET	No	No	Yes	Yes	**Yes**
LETTER QUALITY PRINT	Yes	Yes	Yes	Yes	**Yes**
CUSTOM INTER-FACE OPTION	No	No	No	No	**Yes**
PRICE	£1675	£1950	£1950	£1450	**£1450**

The above information was gathered from distributors and abstracted from their current literature. Prices shown are those advertised at the present time.

MICROPUTE
microcomputer systems

Catherine Street, Macclesfield, Cheshire. SK11 6QY. Tel: Macclesfield 612759

Paint a picture

A PROGRAM to produce pictures comes from R. Trimmer of Dunstable, Bedfordshire, making good use of the Apple II's graphics. The standard Apple paddles are used to create pictures on the high-resolution screen, the paddles themselves controlling a large part of the program.

When the program is running, you can call up the menu by pressing the button on the controller. The menu offers seven options: Save, Load, Colour, Rubout, Delete, New Exit. The Colour function allows parts of the picture to appear in different colours or shades. Rubout allows removal of lines or dots by the use of the paddles.

Up to seven pictures can be saved on a standard 5in. disc, together with the program. Each complete screen of high-resolution graphics requires 8K memory, or 34 tracks.

Paint a picture.

```
1  HOME : GOSUB 1000
5  POKE  - 16304,0: HOME
6  HGR
7  HCOLOR= Z
10  GOSUB 60
20  HPLOT X,Y
30  GOSUB 60
40  HPLOT  TO X,Y
50  GOTO 30
60 X =  PDL (1) / .914
65  IF  PEEK ( - 16286) > 127 THEN 90
66  IF  PEEK ( - 16287) > 127 THEN 90
70  LET Y =  PDL (0) / 1.6
80  RETURN
90  POKE  - 16301,0
91  POKE 35,21
92  POKE 34,21
94  POKE 33,39
95  HOME
100  INVERSE : PRINT "SAVE LOAD COLOR RUBOUT DELETE NEW EXIT";: GET A$
101  IF A$ = "S" THEN 500
102  IF A$ = "L" THEN 600
103  IF A$ = "E" THEN  NORMAL : HOME : TEXT : NEW
104  IF A$ = "R" THEN  HOME : LET Z = 4: GOTO 7
105  IF A$ = "N" THEN  GOTO 5
106  IF A$ = "D" THEN 700
130  PRINT " SHADE CHANGE OF 1 2 3 5 6    ";: GET Z
140  HOME : POKE  - 16304,0: GOTO 7
500  REM  SAVE HI-RES PIC
520  INPUT " NAME FOR PICTURE   ";A$
530  PRINT  CHR$ (4);"BSAVE "A$", L8192, A8192"
540  GOTO 140
600  REM  LOAD HI-RES PIC
620  INPUT " NAME OF PICTURE   ";A$
630  HGR
640  PRINT  CHR$ (4);"BLOAD "A$", A8192"
650  GOTO 91
700  REM  DELETE HI-RES PIC
710  INPUT " NAME OF PICTURE    ";A$
720  PRINT  CHR$ (4)"DELETE "A$
730  GOTO 91
1000  FOR S = 1 TO 4: PRINT : NEXT : PRINT  TAB( 10): FLASH : PRINT "ELEC
     TRONIC SCRIBBLE PAD": NORMAL
1005  PRINT : PRINT
1010  PRINT : PRINT : PRINT "THIS PROGRAM WILL ALLOW YOU TO CREATE A PICT
     URE USING THE HIGH RESOLUTION GRAPH—ICS."
1020  PRINT "IF THE CONTROLLER BUTTON IS PRESSED THE SCREEN WILL GO BLANK
     .";
1025  PRINT "TO DISPLAY THE MAIN MENU PRESS THE BUTTON AGAIN."
1030  FOR R = 1 TO 5000
1035  IF  PEEK ( - 16287) > 127 THEN  IF  PEEK ( - 16286) > 127 THEN  GOTO
     10000
1040  IF  PEEK ( - 16286) > 127 THEN 5
1050  IF  PEEK ( - 16287) > 127 THEN 5
1060  NEXT
10000  TEXT
10010  PRINT  TAB( 10): FLASH : PRINT "PADDLES NOT PLUGGED IN": NORMAL
10015  FOR S = 1 TO 10
10020  FOR A = 1 TO 100:X =  PEEK ( - 16336): NEXT
10030  NEXT
10040  HOME : POKE 35,0: POKE 34,0: POKE 32,0: POKE 33,0
```

Heart throb

THIS MEMORY-DUMP routine can be used to modify the Space Invaders program so that it will produce the famous menacing heartbeat, writes D T Jones of Woodside Park, London.

Enter the hexadecimal as listed,

```
6100- A9 00 8D 6A 61 8D 6C 61
6108- A9 50 8D 6B 61 20 3D 4E
6110- 20 58 FC 4C 00 5F EE 6A
6118- 61 AD 6A 61 C9 10 D0 1F
6120- A9 00 8D 6A 61 CE 6B 61
6128- AD 6B 61 C9 19 D0 05 A9
6130- 50 8D 6B 61 AD 6B 61 8D
6138- 5A 61 4A 4A 8D 4D 61 BC
6140- 20 19 60 20 4A FF EE 6C
6148- 61 AD 6C 61 C9 14 B0 06
6150- AD 30 C0 4C 62 61 AD 6C
6158- 61 C9 50 90 05 A9 00 8D
6160- 6C 61 20 3F FF A5 19 C9
6168- F0 60 00 50 00 A9 14 8D
6170- 4D 61 A9 50 8D 5A 61 A9
6178- 00 8D 6A 61 8D 6C 61 A9
6180- 50 8D 6B 61 4C 00 5F 00

12F2- 20 43 61 EA
1A31- 20 16 61
5F2A- 4C 6D 61
```

and save it on tape by typing:

800.61FFW

With that done, the invaders will make the familiar increasing throb. To run the new version, type 6100G.

To put the program on disc, type.

7FD: 4C 00 61

BSAVE INVADERS, A$7FD,L$5A03

To run, type

BRUN INVADERS

Toolkit fault

BELIEVE IT or not I have discovered a fault in some Apple software, writes Shaun Hope of Milton Malsor, Northamptonshire. The disc in question is the DOS Toolkit — Apple part number A2D-0029 — and the problem appeared on the Applesoft Programmers Aid, APA, program.

At first I could not believe my eyes but finally decided that something must be wrong. I got in touch with Apple U.K., who confirmed the problem but have been unable to find a solution.

The fault arises with the &XREF command referred to on page 10 of the Toolkit manual. It is supposed to give a complete cross-reference of all variables used in a program but it does not always work. To see the problem run Loadapa, then type New and enter the following example program:

```
10 DATA 10
20 READ A
30 PRINT A
40 END
```

Typing &X should give

A 20,30

(continued on next page)

◀ ● Circle No. 188

(continued from previous page)

but it does not.

Now delete line 10. Typing &X now does give:

A 20,30

so it appears the cross-reference command does not like data statements — a rather fundamental omission. Apple promised to let me know when the problem had been sorted out, but that was back in July.

Apart from this slight bug the disc provides an excellent suite of programs and it is surprising that Apple has not gone out of its way to promote it. Apart from the Toolkit — which gives such commands as auto line number, renumber, append and compress — there is the comprehensive assembler/editor and a high-resolution character generator complete with countless sets of foreign scripts.

Grandfather clock

I HAVE ALWAYS wanted a grandfather clock, writes R D Walker of Sutton Coldfield, West Midlands. The trouble is that I also wanted an Apple computer, and the micro won.

Whilst delving into the more interesting parts of the Apple it soon became clear that the combination of graphics and sound could satisfy my other desire, and give me the opportunity to get to know my new acquisition.

The program is rather novel in that it produces a circular clock face, displaying the hour and minute hands which will move in the normal way. The inclusion of a conventional second hand looked a little confusing, so the seconds are shown by a dot which steps around the clock face at one-second intervals. The clock strikes the hours in the same way as a grandfather clock.

A gesture to modern times is the inclusion of a digital display at the bottom of the clock face, which changes at the same time as the hands.

During the chiming sequence, no other activity is possible. The seconds dot must therefore be advanced afterwards by an amount determined by the time taken to chime the hours.

The clock does not depend on any internal timer, but uses the inherent delay caused of the For loop. Timing can be adjusted merely by modifying the value of TT in line 16. The accuracy of the seconds advancement each hour can be adjusted by altering the time taken for the chimes in line 5080.

The tone generator is set up in lines 1 to 7 and this machine-code program is called by the data in lines 5090 to 5120. Each of the numbers there causes a different note to be produced. It would be quite easy to extend the program to chime the quarter hours as well by selectively taking each of these lines as required.

Lines 10 to 13 set the co-ordinates of the circle and line 14 is the value of PI. Line 16 sets the clock accuracy and line 17 gives the hand lengths.

Lines 50 to 90 request the time to be set up; if the response is not in the form HHMM you will be asked to re-enter the time.

The seconds dot is moved around the clockface by lines 99 to 140. The colour is changed to erase the previous dot from the screen.

Every 60 seconds, the hands position is changed. Lines 199 to 230 take care of this and reverse the colour to erase the previous setting. Lines 349 to 450 put a leading zero to the digital display when needed. Line 5140 corrects the time after the chimes and hours have sounded.

Grandfather clock.

```
1  REM   INITIALISE TONES
2  FOR A = 768 TO 786: READ X: POKE A,X: NEXT A
3  DATA  162,255,164,0
4  DATA   136,234,234,234,234,234,208,248
5  DATA   173,48,192
6  DATA   202,208,240
7  DATA  96
10  HGR : HCOLOR= 7
11 A = 139: REM  HALF WAY ACROSS SCREEN
12 B = 79: REM   HALF WAY DOWN SCREEN
13 R = 75: REM   RADIUS OF CIRCLE
14 PI = 3.1415
15 SC =  - 1: REM  SECONDS START AT -1
16 TT = 460: REM   *** THIS IS THE TIME ADJUSTMENT (HIGHER TO SLOW
     DOWN, LOWER TO SPEED UP ) ***
17 ML = 70:HL = 50: REM  MINUTE AND HOUR HAND LENGTH
19  REM  PLOT CLOCK FACE
20  FOR X = 0 TO 2 * PI STEP PI / 30
25 SC = SC + 1
26  IF SC = 5 THEN SC = 0:RX = 5
30  HPLOT A + (R *  SIN (X)),B - (R *  COS (X)) TO A + ((R - RX) *
     SIN (X)),B - ((R - RX) *  COS (X))
35 RX = 0
40  NEXT X
50  HOME : VTAB 23: PRINT "ENTER  THE TIME AS HHMM": INPUT TM$
60 H =  VAL ( LEFT$ (TM$,2)):M =  VAL ( RIGHT$ (TM$,2))
70  IF H < 0 OR H > 12 OR M < 0 OR M > 60 THEN  PRINT "ERROR": FOR
     X = 1 TO 500: NEXT X: VTAB 24: PRINT : GOTO 50
80  HOME
90  GOSUB 1000: GOTO 400
99  REM  DISPLAY THE SECONDS 'DOT'
100 SC = 0
105  FOR X = SC TO 2 * PI STEP PI / 30
110  HCOLOR= 7: GOSUB 2000
120  FOR ZZ = 1 TO TT: NEXT ZZ
130  HCOLOR= 0: GOSUB 2000
140  NEXT X
199  REM  CLEAR THE LAST HANDS SETTING
200  HCOLOR= 0: GOSUB 1000
210  HCOLOR= 7
219  REM  CALCULATE THE NEW SETTING AND PLOT
220 M = M + 1:  IF M = 60 THEN M = 0:H = H + 1:  IF H = 13 THEN H =
     1
230  GOSUB 1000
349  REM  ADD LEADING ZERO TO MINUTES
350 S$ = "": IF M < 10 THEN S$ = "0"
400  VTAB 24: HTAB 16: PRINT "                ";
410  VTAB 24: HTAB 16: PRINT H;"    :    ";S$;M;
440  IF M = 0 THEN  GOSUB 5000: GOTO 105
450  GOTO 100
999  REM  CALCULATE AND PLOT HANDS SETTING
1000 TM = M / 30 * PI:TH = ((H / 6) + (M / 360)) * PI
1010  HPLOT A + (ML *  SIN (TM)),B - (ML *  COS (TM)) TO A,B TO A +
     (HL *  SIN (TH)),B - (HL *  COS (TH))
1020  RETURN
1999  REM  SECONDS DOT DISPLAY AND TICK
2000  HPLOT A + ((R - 2) *  SIN (X)),B - ((R - 2) *  COS (X))
2010 TK =  PEEK ( - 16336)
2050  RETURN
5000  REM  CHIMES SUBROUTINE
5080  FOR MM = 1 TO 4: FOR N = 1 TO 4: READ P: POKE 0,P: CALL 768:
     NEXT N: FOR X = 1 TO 500: NEXT X,MM
5090  DATA 150,120,135,200
5100  DATA 150,135,120,150
5110  DATA  120,150,135,200
5120  DATA 200,135,120,150
5130  FOR MM = 1 TO H: POKE 0,150: CALL 768: FOR X = 1 TO 480: NEXT
     X,MM
5139  REM  ADD SECONDS TO ALLOW FOR TIME TAKEN FOR CHIMES
5140 SC = PI / 3 + (H * PI / 30)
5150  RETURN
```

Tabulating data — driver program.

```
10  FOR I = 0 TO 5 STEP 1.25
20 ZD = 2:ZS = 7:ZZ = I: GOSUB 40400
30 ZZ = I * I: GOSUB 40400
40 ZD = 0:ZS = 4:ZZ = I * 10: GOSUB 40400
50 ZD = 4:ZS = 9:ZZ =  COS (I) -  SIN (I): GOSUB 40400
60  PRINT
70  NEXT I
80  END
```

Main subroutine.

```
40400 ZA =  VAL ("1E" +  STR$ (ZD)):ZB =  INT (ZZ * ZA + .5)
40410 ZI = 0:ZK = 0:
40420  IF ZD = 0 THEN ZK = 0: GOTO 40470
40430  IF ZB = 0 THEN ZK = ZD + 1: GOTO 40470
40440 ZC$ =  STR$ (ZB)
40450 ZT = ZD: IF  LEN (ZC$) < ZD THEN ZT =  LEN (ZC$)
40460  FOR KZ = 1 TO ZT: IF  MID$ (ZC$, LEN (ZC$) + 1 - KZ,1) = "0" THEN Z
     K = ZK + 1: NEXT KZ: IF ZK = ZT THEN ZK = ZT + 1
40470 ZI = ZB / ZA:ZC$ =  STR$ (ZI)
40480  PRINT  SPC( ZS -  LEN (ZC$) - ZK);ZI;
40490  IF ZK = 0 THEN 40520
40500  IF ZK > ZT THEN  PRINT ".";: FOR ZM = 1 TO ZK - 1: PRINT "0";: NEXT
     ZM: GOTO 40520
40510  FOR ZM = 1 TO ZK: PRINT "0";: NEXT ZM
40520  RETURN
```

Example programs and output.

```
100 REM MENU SELECTABLE PRINTER
110 PRINT"1. PRINT TITLE.":PRINT
120 PRINT"2. PRINT DATE.":PRINT
130 PRINT"3. PRINT COST.":PRINT
140 PRINT"4. RETURN TO MAIN MENU":PRINT
150 VTAB20:HTAB5:INPUT"SELECT <1 - 4>   ";M$:PRINT
160 M=VAL(M$):IF(M<1) OR (M>4) THEN 150
170 IF RIGHT$(M$,1)="P" THEN PR#1:PR$="P":GOTO 190
180 PR$="NP"
190 ON M GOTO --------
```

```
]RUN
     0.00     0.00    0     1.0000
     1.25     1.56   13     -.6337
     2.50     6.25   25    -1.3996
     3.75    14.06   38     -.2490
     5.00    25.00   50     1.2426
```

Data tabulator

THE PROBLEM of tabulating data is tackled in this subroutine from S M Fraser of Glasgow. Instead of the Print-Using format it uses variables to specify

- number of decimal places, ZD = 2,
- field width, ZS = 10,
- number to be tabulated, ZZ = 1.

Although it does not give scientific notation, it is useful for the majority of applications and is economical in its memory requirements.

Another useful facility, is a printer-on command letter when selecting from a menu. By taking the input from the Menu Select to be a string variable, the choice can be made as, e.g., 2 or 2P. If the number alone is selected then the information is written to the screen but if 2P is selected then the information is printed to the printer as well as being displayed on the screen.

The printer should be turned off at some appropriate point by

```
IF PR$ = "P" THEN PR#0
```

Reading from screen

A USEFUL FEATURE in any data-entry program is the ability to edit any characters displayed on the screen, and to do this some way of reading from the screen is necessary. The routine devised by Phil Reeve of Birmingham could provide the basis for such a function.

By supplying the row R — 0 to 23 — and the column C — 0 to 39 — of the screen position required, the character Y$ can be read from the screen.

The heart of the routine is the function defined at line 100 and used at line 110, which calculates the position in memory of the required row. Lines 130 to 190 are an optional routine which converts the character read into the range ASCII 32 to 95, i.e., the range of character values normally input from the keyboard. This routine is essential if inverse or flashing characters are to be read.

The majority of the remaining lines are for demonstration purposes only and all except 120 and 200 may be omitted. The routine reads any character from the text page 1 display regardless of video mode and window settings.

Read-from-screen routine.

```
10  REM ************************
20  REM * ROUTINE TO READ CHAR *
30  REM * FROM THE SCREEN      *
40  REM *                      *
50  REM *       PHIL REEVE,    *
60  REM *        OCTOBER ,1981 *
70  REM ************************
80  REM  R = ROW    (0 TO 23)
90  REM  C = COLUMN (0 TO 39)
100  DEF  FN A(X) = 1024 +  INT (X / 8) * 40 + (X / 8 -  INT (X / 8)) * 1024

103  GOSUB 2000: REM ** TEMP GOSUB **
105  GOSUB 1000: REM ** TEMP GOSUB **
110 X =  FN A(R) + C
120 Y =  PEEK (X)
130  REM ** OPTIONAL ROUTINE TO CONVERT CHAR TO ASCII RANGE 32-95 **
140  IF Y < 32 THEN Y = Y + 64: GOTO 200: REM -INVERSE
150  IF Y < 64 THEN 200: REM -INVERSE
160  IF Y < 96 THEN 200: REM -FLASHING
170  IF Y < 128 THEN Y = Y - 64: GOTO 200: REM -FLASHING
180 Y = Y - 128: REM -NORMAL
190  REM ** END OF OPTIONAL ROUTINE **
200 Y$ =  CHR$ (Y)
210  GOSUB 3000: REM ** TEMP GOSUB **
220  GOTO 105: REM ** TEMP GOTO **
999  END
1000  REM *** TEMP GOSUB FOR DEMO ONLY ***
1010  VTAB 22:  CALL  - 958
1020  INPUT "ROW,COLUMN ?";R,C
1030  VTAB 22: HTAB 30: PRINT "=>";
1999  RETURN
2000  REM *** TEMP GOSUB FOR DEMO ONLY ***
2005  HOME
2007  FLASH : REM (OR INVERSE OR NORMAL)
2010  FOR I = 1 TO 15
2020  FOR J = 32 TO 95
2030  PRINT  CHR$ (J);
2040  NEXT J,I
2050  NORMAL
2999  RETURN
3000  REM *** TEMP GOSUB FOR DEMO ONLY ***
3010  PRINT  CHR$ (Y)
3020  INPUT "HIT RETURN TO CONTINUE";A$
3999  RETURN
```

Protecting code

A YEAR AGO I acquired a Tandy hardware modification to my TRS-80 to enable lower-case video, writes Tom Corrigan of Houghton-le-Spring, Tyne and Wear. The result is excellent, but the driver software tends to get in the way of other routines. There are a number of methods of protecting a machine-code subroutine — the standard one reserves memory size on power-up. The problems arise when two or more routines occupy the same area of memory.

I have overcome this for my own lower-case by having a modified ROM A installed, but for those who do not have this modification, I offer the following routine which finds space for itself in high RAM and reserves its own memory size.

The length of the operating routine is measured by the label Progl and this value is subtracted from the four vectors dependent upon memory size reserved. The memory size reserved is increased by an amount equal to the length of the program, approximately 100 bytes. All addresses within the program are adjusted relative to the modified memory size, and the operating routine is relocated immediately above it and hence, immediately beneath any resident high-

RAM machine-code routine.

The TRS-80 keyboard produces lower-case characters with the shift key and upper-case without. To invert this and simulate a typewriter, alphabetic characters are trapped and exclusively Ored with 20H, in line 1360. As written, line 1360 has the instruction Ret, but on initiation the facility is switched off and when shift zero is typed, line 1230 changes C9H (RET) to EEH (XOR nn) by exclusive Or with 27H. At the same time, the video-driver address is exchanged with that stored at the location which, prior to relocation, is labelled Vidstr.

The character generator has a £ sign which can be displayed with the ASCII value 60H and obtained from the keyboard by shift @. This cannot, however, be used where it would be most desired: in the Print Using field specifier. The initialising part of the program asks if an exchange is required and, if so, substitutes 20H (JR NZ) for 18H (JR) at line number 1490. If a dollar sign appears in the video stream, it is replaced with a £ sign. This has no other effect, although a £ sign follows all string variables, instead of the usual dollar sign in Basic program listings.

The program will run under level II or DOS, the exit address being selected by the routine in lines 850 to 890. However, if an expansion interface is connected, but no disc drive, then line 880 should be modified to read

JP 1A19H

Once the routine is initialised, the lower case and keyboard inversion may be switched in and out alternately, by typing shift zero. Those who have no editor/assembler can insert the object code directly into memory, using a monitor such as T-Bug.

```
0100
0110          ORG     6000H
0120
0130
0140 ;     MODIFY MEMORY SIZE
0150
0160 START    LD      DE,PROGL        ; PROGRAM LENGTH
0170          LD      HL,(40D6H)      ; MEM SIZE
0180          OR      A
0190          SBC     HL,DE
0200          LD      (40D6H),HL      ; MEM SIZE ADJUSTED
0210          LD      (40B1H),HL      ; BASIC TOP LIMIT
0220          INC     HL
0230          INC     HL
0240          LD      (4049H),HL      ; HIMEM FOR DOS
0250          LD      DE,34H
0260          OR      A
0270          SBC     HL,DE
0280          LD      (40A0H),HL      ; STRING SPACE
0290          LD      (40E8H),HL      ; BASIC STACK POINTER
0300          LD      SP,HL           ; LOCATE STACK
0310
0320
0330 ;  POSITION PROGRAM ABOVE NEW MEM SIZE
0340
0350          LD      HL,(4049H)      ; RETRIEVE START ADDRESS
0360          LD      (KVEC+1),HL     ; KEYBOARD DIVERSION
0370          INC     HL
0380          LD      (KVEC-2),HL     ; FOR KEYBOARD ROM CALL
0390          LD      DE,3AH
0400          ADD     HL,DE
0410          LD      (SVEC1+1),HL    ; FOR SHIFT 0 TO
0420          LD      (SVEC2+1),HL    ; TOGGLE KEYBOARD
0430          INC     HL
0440          INC     HL
0450          INC     HL
0460          LD      (VIDSTR),HL     ; FOR VIDEO DRIVER
0470          LD      DE,24H
0480          ADD     HL,DE
0490          LD      (VVEC2+1),HL    ; FOR SHIFT 0 TO
0500          LD      (VVEC3+2),HL    ; TOGGLE LOWER CASE
0510
0520          CALL    1C9H            ; CLS
0530          LD      HL,MESS         ; PRINT MESSAGE
0540          LD      DE,3D00H        ; REQUESTING POUNDS
0550          LD      BC,MESSL        ; FOR DOLLARS
0560          LDIR
0570
0580 LOOP1    LD      A,(3802H)       ; SCAN KEY ROW
0590          AND     40H             ; "N" ?
0600          JR      NZ,NOPND
0610          LD      A,(3808H)       ; SCAN KEY ROW
0620          AND     2               ; "Y" ?
0630          JR      Z,LOOP1
0640
0650          LD      A,20H           ; INSERT
0660          LD      (POFFON),A      ; JR   NZ,
0670
0680 NOPND    LD      HL,KEYBD        ; LOCATE
0690          LD      BC,PROGL        ; PROGRAM
0700          LD      DE,(4049H)      ; ABOVE
0710          LDIR                    ; MEM SIZE
0720
0730          CALL    1C9H            ; CLS
0740
0750
0760          LD      HL,(4016H)      ; INITIATE
0770          LD      (KEYBD+1),HL    ; KEYBOARD
0780 KVEC     LD      HL,KEYBD        ; DIVERSION
0790          LD      (4016H),HL
0800
0810
0820 ;         ALL SET
0830 ;         NOW RETURN
0840
0850          LD      A,(37ECH)       ; CHECK FOR
0860          INC     A               ; DISKS
0870          CP      2
0880          JP      C,1A19H         ; LEVEL II BASIC
0890          JP      402DH           ; OTHERWISE DOS
0900
0910
0920 ;         MESSAGE BUFFER
0930
0940 MESS     DEFM    'DO YOU WANT "'
0950          DEFB    24H             ; DOLLAR SIGN
0960          DEFM    '" CHANGED TO "'
0970          DEFB    60H             ; POUND SIGN
0980          DEFM    '" ? '
0990          DEFB    5FH
1000 MESSL    EQU     $-MESS          ; MESSAGE LENGTH
1010
1020
1030 ; THE FOLLOWING PART OF THE PROGRAM IS RE-LOCATED
1040
1050 KEYBD    CALL    3E3H            ; SCAN WHOLE OF KEYBOARD
1060          PUSH    AF
1070          LD      A,(3880H)       ; SHIFT KEY PRESSED?
1080          OR      A
1090          JR      Z,NOTOG
1100          LD      A,(3810H)
1110          AND     1               ; ZERO KEY PRESSED?
1120          JR      Z,NOTOG
1130 LOOP2    LD      A,(3880H)       ; SHIFT KEY
1140          OR      A               ; RELEASED?
1150          JR      NZ,LOOP2
1160
1170 VVEC2    LD      HL,(VIDSTR)     ; TOGGLE
```

(continued on page 147)

YOUR GUIDE TO GOOD COMPUTING BOOKS

If you are a user, a businessman, a student, a programmer or just beginning in microcomputing, then you should read MICROCOMPUTER READ-OUT

- NEWS • VIEWS • REVIEWS
- WHAT TO READ IN MICROCOMPUTING

*SENT TO YOU—ABSOLUTELY **FREE** OF CHARGE*

REGISTER FOR YOUR *FREE* COPY BELOW

To: MICROCOMPUTER READ-OUT
Gower Publishing Company Limited, Gower House, Croft Road, Aldershot, Hants. GU11 3HR

Please send me my FREE copy of MICROCOMPUTER READ-OUT
I am a microcomputer owner, model type: ☐ PET ☐ ZX 80/81 ☐ TRS-80 ☐ APPLE ☐ ATOM

☐ Other (please specify) _____ I am a: ☐ Student ☐ Hobbyist ☐ Businessman ☐ Professional computerist

Name _____

Address _____

PC/MR/82

● Circle No. 189

DEMODISK ... now includes a free comprehensive BASIC language tutorial on the reverse side.

STOP!

STOP BUYING THOSE "CANNED" DATABASE PROGRAMS THAT TURN OUT TO BE COSTLY, INEFFECTIVE AND INCOMPLETE. NOW THERE IS ONE SYSTEM WITH THE POWER, THE VERSATILITY YOU NEED TO MAKE PROGRAMING FASTER, SIMPLER AND ERROR FREE. C.O.R.P. IS A PROGRAM GENERATOR THAT WRITES SOFTWARE. COMPLETE APPLESOFT PROGRAMS THAT EXECUTE INDEPENDENTLY AND MAY BE MODIFIED BY THE USER, BASED ON INFORMATION SUPPLIED IN THE USERS OWN EVERYDAY LANGUAGE. WHAT'S MORE, COMPLETE PROGRAM GENERATION TAKES ONLY A FEW MINUTES.

C.O.R.P.™

PROGRAM GENERATOR

... the programs that write programs

C.O.R.P. CONSISTS OF 6 MAJOR SUBSYSTEMS: A DATA ENTRY PROGRAM GENERATOR, A SORT SUBSYSTEM, AN UPDATE SUBSYSTEM, A PRINT GENERATOR AND A COMPLETE UTILITIES & DIAGNOSTIC PACKAGE. TOGETHER THE 6 SUBSYSTEMS MAKE C.O.R.P. THE MOST ADVANCED, COMPLETE AND USEFUL TOOL AVAILABLE FOR YOUR APPLE II*. ALL FOR THE INCREDIBLY LOW PRICE OF £235.00. NO OTHER PROGRAM GENERATOR OFFERS SO MUCH VERSATILITY FOR SUCH A PRICE. TO PURCHASE C.O.R.P. BRING THIS AD. TO YOUR LOCAL DEALER OR ORDER FROM US DIRECTLY.

MICROSYSTEMS LIMITED

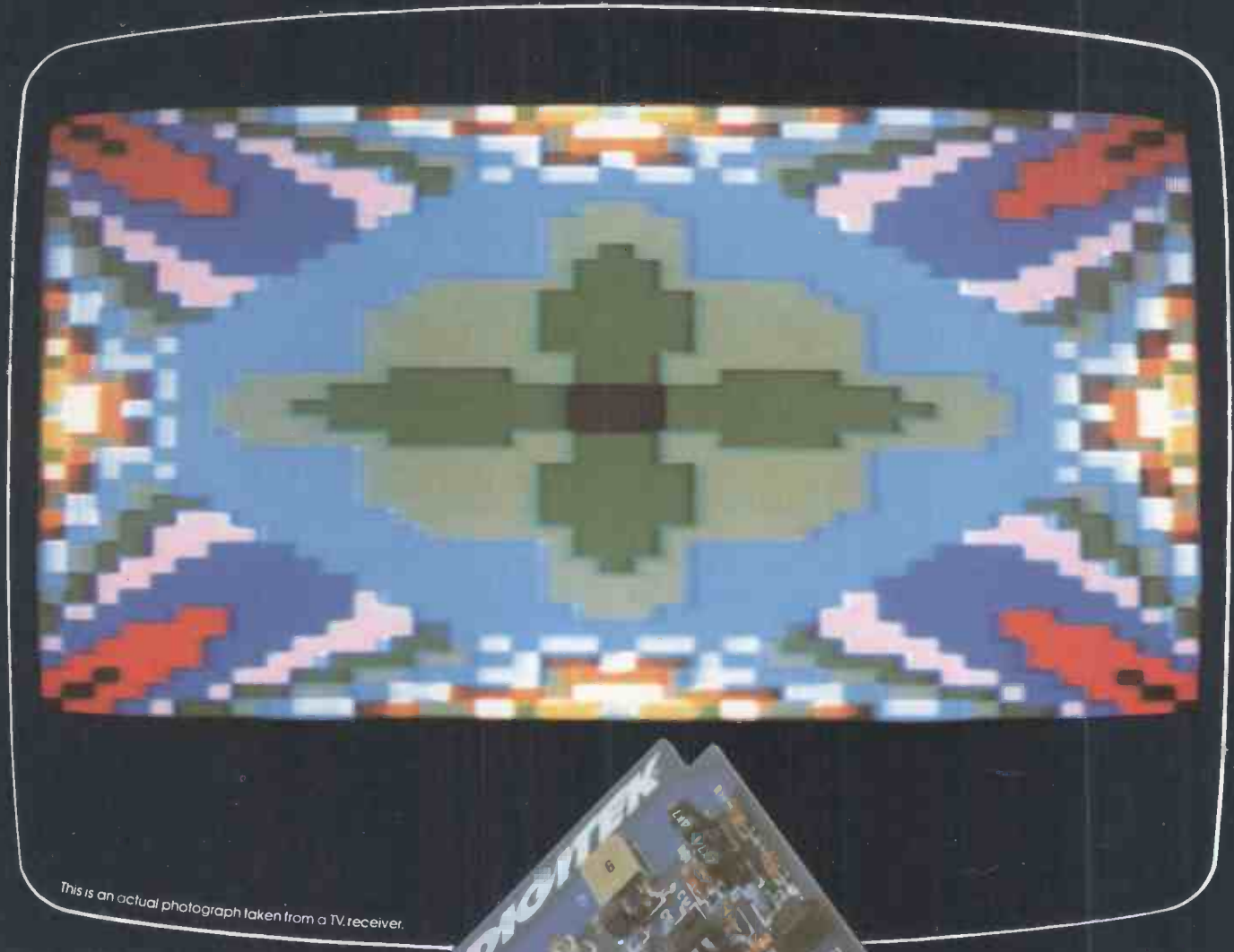
SUMMERFIELD HOUSE, VALE, GUERNSEY, EUROPE—G.B.
Telephone: 0481 47377
Telex: 4191130 (DYNMIC G)

*C.O.R.P. is a registered trademark of the MAROMATY & SCOTTO SOFTWARE CORP.

*APPLE is a registered trademark of APPLE COMPUTER INC.

● Circle No. 190

DO NOT ADJUST YOUR SET!



This is an actual photograph taken from a TV receiver.

That's the colour of the Digitek PAL Encoder Card for APPLE II computers.

Featuring an on-board UHF modulator and the unique Digitek 'Safety Tab' for sure, easy handling.
This principal member of the Digitek range of Apple expander cards not only gives the best quality PAL version of the Apple's colour graphics capabilities, but is also simplicity itself to install.
One plug-in card is all it takes to transform your dull display into a techni-colour masterpiece.
Also in the Expander Range are a 16k Ramcard, Z80 Expansion card, High speed serial interface, and more!
Send in the coupon for details and your nearest stockist.

DIGITEK©

EXPANDER CARD SERIES

The people who are really into Apples.

Please send me further details on your range of Apple computer Expander Cards.

Name _____

Address _____

Post Code _____

Digitek International Ltd., Unit 14, Grafton Place, Dukes Park Industrial Estate, Chelmsford, Essex, England

(continued from page 144)

```
1180            LD      DE,(401EH)      ; LOWER
1190            LD      (401EH),HL      ; CASE
1200 VVEC3      LD      (VIDSTR),DE     ; VIDEO
1210
1220 SVEC1      LD      A,(SWAP)        ; TOGGLE
1230            XOR     27H             ; KEYBOARD
1240 SVEC2      LD      (SWAP),A        ; INVERSION
1250
1260 NOTOG      POP     AF
1270            CP      41H             ; FILTER
1280            RET     C
1290            CP      7BH             ; OUT
1300            RET     NC
1310            CP      5BH             ; ALPHABETIC
1320            JR      C,SWAP
1330            CP      61H             ; CHARACTERS
1340            RET     C
1350
1360 SWAP       RET                     ; CHANGED TO
1370            DEFB    20H             ; XOR   20H
1380            RET                     ; BY SHIFT ZERO
1390
1400 VIDEO      LD      L,(IX+03H)      ; POINTER TO
1410            LD      H,(IX+04H)      ; CURSOR LOCATION.
1420            JP      C,049AH         ; LINE FEED
1430            LD      A,(IX+05H)      ; CURSOR FLAG
1440            OR      A               ; TEST FOR CURSOR ON.
1450            JR      Z,CURSOF
1460            LD      (HL),A          ; MOVE CURSOR.
1470 CURSOF     LD      A,C             ; ASCII BYTE
1480            CP      24H             ; DOLLAR SIGN?
1490 POFFON     JR      NODOL
1500            LD      A,60H           ; POUND SIGN.
1510 NODOL      CP      20H
1520            JP      C,0506H         ; CONTROL CODE
1530            CP      80H
1540            JP      NC,04A6H        ; GRAPHIC CHARACTER
1550            JP      047DH
1560
1570
1580 VIDSTR     DEFS    4               ; VIDEO DRIVER ADDRESS STORE
1590
1600 PROGL      EQU     $-KEYBD         ; PROGRAM LENGTH GAUGE.
1610
1620            END     START
```

```
6000  11 66 00 2A D6 40 B7 ED 52 22 D6 40 22 B1 40 23
6010  23 22 49 40 11 34 00 B7 ED 52 22 A0 40 22 E8 40
6020  F9 2A 49 40 22 7C 60 23 22 79 60 11 3A 00 19 22
6030  D5 60 22 DA 60 23 23 23 22 11 61 11 24 00 19 22
6040  C7 60 22 D2 60 CD C9 01 21 BD 60 11 00 3D 01 22
6050  00 ED B0 3A 02 38 E6 40 20 0C 3A 08 38 E6 02 28
6060  F2 3E 20 32 00 61 21 AF 60 01 66 00 ED 5B 49 40
6070  ED B0 CD C9 01 2A 16 40 22 B0 60 21 AF 60 22 16
6080  40 3A EC 37 3C FE 02 DA 19 1A C3 2D 40 44 4F 20
6090  59 4F 55 20 57 41 4E 54 20 22 24 22 20 43 48 41
60A0  4E 47 45 44 20 54 4F 20 22 60 22 20 3F 20 5F CD
60B0  E3 03 F5 3A B0 38 B7 28 23 3A 10 38 E6 01 28 1C
60C0  3A B0 38 B7 20 FA 2A 11 61 ED 5B 1E 40 22 1E 40
60D0  ED 53 11 61 3A EA 60 EE 27 32 EA 60 F1 FE 41 D8
60E0  FE 7B D0 FE 5B 38 03 FE 61 D8 C9 20 C9 DD 6E 03
60F0  DD 66 04 DA 9A 04 DD 7E 05 B7 28 01 77 79 FE 24
6100  18 02 3E 60 FE 20 DA 06 05 FE 80 D2 A6 04 C3 7D
6110  04
```

Road racing

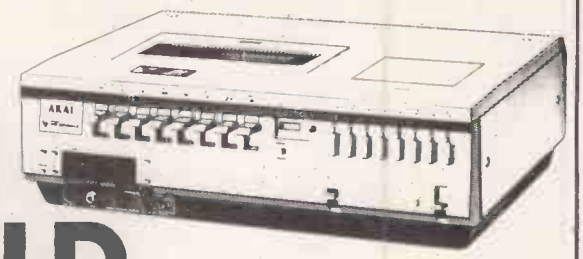
IN ROAD RACE, from John Taylor of Orpington, Kent, two players race each other to finish the track first. As they move, each player collects a score.

There are two different levels of difficulty in this game: to leave a trail or not to leave a trail. If you leave a trail you increase your score more quickly, but you lose if you touch your track or your opponent's track. You also lose if you hit the side of the track.

The object of Road Race is to move your car from the start of the track to the bottom, or finish, of the track.

```
10 REM ** SET UP GAME **
15 CLS:CLEAR400:P=15360
20 REM ** INSTRUCTIONS **
25 PRINT,'ROAD RACE.'!PRINT!PRINT:PRINT!PRINT
30 INPUT'DO YOU WISH TO LEAVE A TRAIL (YES/NO) ';Y$
35 IF Y$='YES' THEN Y$='Y': GOTO 50
40 IF Y$='NO' THEN Y$='N': GOTO 50
45 PRINT'INCORECT - TYPE YES OR NO':GOTO 30
50 CLS:PRINT,'ROAD RACE .':PRINT,'BY .... JO!\ TAYLOR.':!PRINT
55 PRINT'DIRECTIONS:-'
60 PRINT'1 2 3 '!PRINT'4 ? 6 ':PRINT'7 8 9 '
65 PRINT'WHEN ASKED TO , ENTER YOUR SPEED (10 - 70 M.P.H.).'
75 PRINT'AND DIRECTION (AS SHOWN ABOVE)'
80 PRINT'YOUR TURN IS INDICATED BY A ';CHR$(191);' BY YOUR '
90 PRINT'PLAYER TWO ?'!INPUT' TYPE 1 OR 2 ';A$:A=VAL(A$)
95 IF A<>1 AND A<>2 THEN PRINT'PLAYER ONE OR ';:GOTO90
100 PRINT'IF YOU HIT OR CRASH INTO THE TRACK WALL OR THE'
105 PRINT'OTHER PLAYERS TRAIL (IF OPTED) - YOU WILL LOSE'
110 PRINT'HIT ANY KEY TO START'!PRINT
115 I$=INKEY$: IF I$='' THEN 115 ELSE CLS
120 REM ** SET UP STRINGS **
125 F$=STRING$(32,32):B$=CHR$(191)
130 T$=' INVALID - TRY AGAIN !'
135 REM ** TRAIL ? **
140 IF Y$='N' THEN TR=1 ELSE TR=10
145 REM ** PRINT TITLES **
150 PRINT' PLAYER ONE'!PRINT' PLAYER TWO'!
155 PRINT@50,'SCORE:';:PRINT@114,'SCORE:';
160 PRINT@19,'SPEED (10- 70 M.P.H.)';:PRINT@83,'DIRECTION (1,2,3,4,6,7,8,9)';
165 REM ** PART OF TRACK FIXED **
170 PRINT@259,'S';:PRINT@899,'F';!PRINT@195,B$;:PRINT@323,B$;:PRINT@835,B$;
175 PRINT@963,B$;
180 FOR ZZ=11 TO 15: SET(4,ZZ):SET(5,ZZ):NEXT ZZ
185 FOR ZZ=8 TO 13: SET(ZZ,9):SET(ZZ,17)!SET(ZZ,39):SET(ZZ,47)!NEXT ZZ
190 REM ** CO-ORDINATES OF PLAYERS **
195 X1=10:X2=10:Y1=11:Y2=15
200 REM ** X1,Y1 =PLAYER ONE . PLAYER TWO =X2,Y2 **
205 REM ** PLOT TRACK FROM DATA **
210 REM ** FIRST TWO X, LAST TWO Y **
215 READ Z,B,C,D
220 IF Z=-1 THEN 400
225 REM ** TEST FOR END OF DATA , (ADD -1,-1,-1,-1,-1 TO END OF YOUR DATA ) **
230 FOR E= Z TO B:FOR F=C TO D
235 SET(E,F):NEXT F:NEXT E:GOTO 215
240 DATA 80,99,32,42,36,36,9,25
245 DATA 36,49,25,25,49,49,15,26
250 DATA 49,95,26,28,14,6(,9,9
255 DATA 60,60,9,14,63,108,14,14
260 DATA 108,108,14,47,14,108,47,47
265 DATA 14,71,39,39,71,71,27,39
270 DATA 71,93,27,27,93,93,20,27
275 DATA 19,26,17,17,26,26,:7,29
280 DATA 26,67,29,29,67,67,20,29
395 DATA -1,-1,-1,-1,-1,-1
400 REM ** PLOT CARS **
405 SET(X1,Y1):SET(X2,Y2)
410 REM ** FIXED DATA **
415 M1=0:M2=0:S1=0:S2=0:ZZ=46:ZA=110
420 REM ** INDICATE WHO PLAYS NOW **
425 IF A=2 THEN 450
430 X=X1:Y=Y1:M1=M1+1
435 POKE P,191:POKE P+13,191
440 POKE P+64,32:POKE P+77,32
441 GOTO 470
445 REM **PLAYER ONE INDICATED **
450 X=X2:Y=Y2:M2=M2+1
455 POKE P,32:POKE P+13,32
460 POKE P+64,191:POKE P+77,191
465 REM ** PLAYER TWO INDICATED **
470 REM ** GET SPEED **
472 QQ=1
475 PP=ZZ:GOSUB 900
478 QQ=0
480 IF ZP>70 THEN GOSUB 800:GOTO470:REM ** INVALID **
485 REM ** GET SPEED FOR DISPLAY **
490 SPEED=INT(ZP/5)
495 REM ** GET DIRECTION (NOT 5 !) **
500 PP=ZA:GOSUB 900
505 REM ** MAKE A MOVE **
510 FOR ZT =1 TO SPEED
515 IF TR=1 THEN RESET(X,Y)
520 IF ZQ=1 THEN X=X+1:Y=Y-1
525 IF ZQ=2 THEN Y=Y-1
530 IF ZQ=3 THEN X=X+1:Y=Y-1
535 IF ZQ=4 THEN X=X-1
540 IF ZQ=6 THEN X=X+1
545 IF ZQ=7 THEN X=X+1:Y=Y+1
550 IF XQ=8 THEN Y=Y+1
555 IF XQ=9 THEN X=X+1:Y=Y+1
560 GOSUB 2000: REM ** TEST FOR A WIN **
565 IF POINT(X,Y)=-1 THEN 1000:REM ** CRASH **
570 SET(X,Y)!NEXT ZT
575 REM ** RETURN CO-ORDINATES **
580 IF A=1 THEN X1=X:Y1=Y
585 IF A=2 THEN X2=X!Y2=Y
590 REM ** SCORE **
595 IF A=1 THEN II=S1 ELSE II=S2
600 II=II+ABS(SPEED=TRAIL/ZQ=ZQ-ZQ)
605 REM ** DISPLAY SCORE **
610 IF A=1 THEN S1=II:PRINT@56,INT(S1);
615 IF A=2 THEN S2=II:PRINT@120,INT(S2)!
620 REM ** THE OTHER PLAYERS GO **
625 A=A+1:IF A=3 THEN A=1
630 GOTO 420
800 REM ** DISPLAY INVALID **
805 PRINT@138,T$;
810 FOR ZQ=1 TO 500:NEXT ZQ
815 PRINT@138,F$;
820 RETURN
900 REM ** FLASH CHR$(191) ON AND OFF **
905 I$="':ZP=0:TF$=''
910 PRINT@PP,CHR$(191)!
915 I$=INKEY$:IF I$<>'' THEN 935
920 FOR ZQ=1 TO 100:NEXT ZQ
925 PRINT@PP,CHR$(32);
930 FOR ZQ=1 TO 100!NEXT ZQ:GOTO910
935 REM ** GET SPEED OR DIRECTION **
940 ZQ=VAL(I$)
941 IF ZQ<1 AND QQ<>1 AND I$='0' THEN GOSUB 800:GOTO910
945 REM ** RETURN INVALID KEYS **
950 IF PP=ZZ ANO ZP=0 THEN ZP=1:TF$=I$:GOTO910
954 REM ** SPEED FIRST PASS **
955 IF PP=ZZ AND ZP=1 THEN TF$=TF$+I$:PRINT@PP,CHR$(32)!:ZP=VAL(TF$):RETURN
965 REM ** SPEED SECOND PASS **
970 ZP=ZQ:PRINT@PP,CHR$(32)!:RETURN
975 REM ** DIRECTION FALL **
1000 REM ** CRASH - DISPLAY ' BANG CRASH FIZZ ' **
1005 CLS:FOR T=1 TO 10
1010 PRINT!PRINT' CRASH-BANG-FIZZ '
1015 NEXT T:PRINT:PRINT:PRINT
1020 PRINT'PLAYER NUMBER ';A;' LOST AS HE HAD '
1025 PRINT'A KEEN INTENTION TO FLY - AND CRASHED !!'
1027 PRINT:PRINT
1030 REM ** SCORE **
1035 PRINT,'ROAD RACE SCORE:-'
1040 PRINT'PLAYER ONE SCORED ';S1;' IN ';M1;' MOVES '
1045 PRINT:PRINT
1050 PRINT'PLAYER TWO SCORED ';S2;' IN ';M2;' MOVES '
1055 PRINT:PRINT'HIT ANY KEY TO CONTINUE':I$=INKEY$
1060 REM ** FIRST INKEY$ AS A STOP **
1065 I$=INKEY$!IF I$='' THEN 1065
1070 CLS:REM ** NEW GAME **
1075 PRINT'DO YOU WISH TO PLAY ROAD RACE AGAIN ?'!PRINT:PRINT
1080 INPUT' TYPE YES/NO ';Y$
1085 IF Y$='NO' THEN 9999
1090 IF Y$='YES' THEN RUN
1095 PRINT'-INVALID - TYPE YES OR NO  !!':PRINT
1100 INPUT'  DO YOU WANT ANOTHER GAME ';Y$:GOTO1085
2000 REM ** TEST FOR A WIN **
2005 IF PEEK(16196)<>131 OR PEEK(16260)<>32 OR PEEK(16324)<>176 THEN 2020
2015 RETURN
2020 CLS:PRINT!PRINT'PLAYER NUMBER ';A;' WON !'
2025 GOTO 1027
9999 CLS:PRINT@450,'PROGRAMME FINISHED.'!PRINT@0,"";:END
```

◀ ● Circle No. 191



1982 SHEFFIELD PERSONAL COMPUTER HI-FI & VIDEO EXHIBITION

COMPUTERS BY-

ACORN
ADLER
APPLE
VIDEO GENIE
COMMODORE VIC
SHARP
CORVUS HARD DISK NETWORK

VIDEO RECORDERS BY-

SHARP
AKAI
FERGUSON
JVC
NATIONAL PANASONIC

ACCESSORIES BY-

WESTRA
B.F.I.
OPUS
MOLIMERX
ACORN SOFT

Hallam Tower Hotel
Broomhill, Sheffield 10
(on A57 Manchester Rd. 1 Mile from city centre).

Fri. 19th March.....12noon~9pm
Sat. 20th March.....10am~8pm
Sun. 21st March.....10am~4pm

Superior Systems Ltd

VISA

178 West Street, Sheffield S1 4ET. Tel. (0742) 755005.

● Circle No. 192

ZX-80s on the brain

The family trait that Son of Thezeus inherited from his father, Thezeus, is the use of a ZX-80 for a brain. Both mice were built from pieces that Alan Dibley found in his junk box. Nick Smith reports.

ONE OF the major advantages of using a ZX-80 as a Micromouse brain is the built-in sensor interface — otherwise known as the keyboard. The keyboard can be regarded as a set of switches which are continually scanned by software. There is nothing to stop you mounting extra switches across the keyboard contacts and using them for sensors. This is best achieved by soldering extra wires on to the printed-circuit board rather than to the key contacts themselves.

The ZX-80 cannot distinguish between a pressed key and a closed sensor which is not normally a problem because Alan Dibley has sawn off the keyboard and only connects it when the mouse is not running. His problems start when setting up a mouse. The ZX-80 input routine waits for the last key to be released, before it will accept the next one, so all the sensors must be open-circuit before the keyboard can be used.

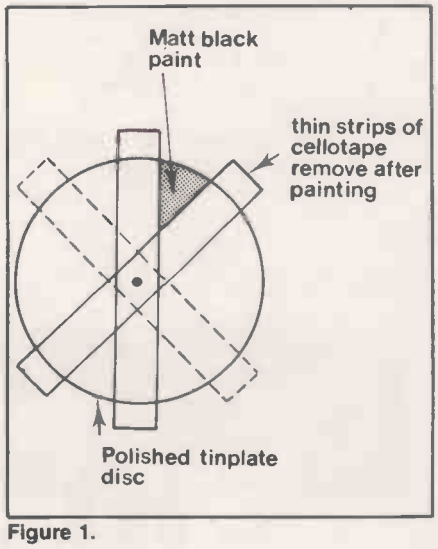


Figure 1.

Dibley's sensors are connected to the 6, 7, 8, 9 and 0 keys at the top right-hand side of the keyboard. The software to read the keys is shown in table 1. The result of the first three instructions is to set the status of the keys in the accumulator. Bit 4 = key 6; bit 3 = key 7; bit 0 = key 0. An open key sets the bit, while a closed key clears it. The complement instruction reverses the process so that a closed key sets the bit.

Apart from microswitches for wall-sensing, Dibley uses infra-red sensing for counting wheel revolutions on Son of Thezeus. A disc resembling a spoked wheel with high-polished spokes and matt black in between is connected to the disc gear — see figure 1. An infra-red LED with a lens is positioned to pick up reflections. The receiver can be connected across any key and is equivalent to a pressed key when it is receiving infra-red — see figure 2. Distance is calculated by counting the number of "spokes" that go past the receiver, i.e., the number of times the "key" appears to be pressed and released.

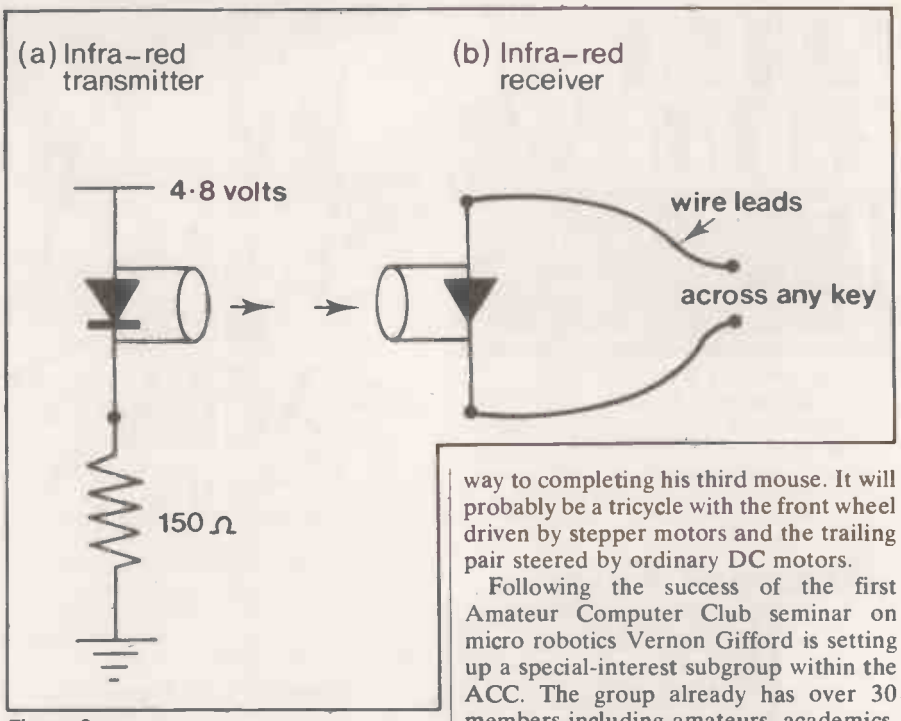


Figure 2.

With this type of circuit the sensor must be checked much more rapidly than the disc can turn, otherwise you start losing distance. The surrounding area is painted matt black, and the sensors and disc are boxed in to protect them from external sources of light.

If you ever see Alan Dibley turning one of the wheels of his mice when they are off the maze, he is probably trying to move the sensor disc so that the receiver is switched off, to allow the keyboard to be used.

When this technique is being used for distance sensing, it is best to fit the sensor to a non-driven wheel, to avoid skidding and similar problems. Otherwise, when the mouse jams itself against a wall, the mouse brain may think it is moving if the driven wheels continue to revolve. One American mouse has a crash-recovery routine which is activated if the distance sensor remains static for a second or more.

Rumour has it that Dibley is well on the way to completing his third mouse. It will probably be a tricycle with the front wheel driven by stepper motors and the trailing pair steered by ordinary DC motors.

Following the success of the first Amateur Computer Club seminar on micro robotics Vernon Gifford is setting up a special-interest subgroup within the ACC. The group already has over 30 members including amateurs, academics, civil servants and manufacturers. If you are interested, write to Vernon Gifford, ACC Micro-Robotics, 111 Selhurst Road, London SE25 6LH, or telephone 01-653 3207.

Over 70 people attended the ACC seminar to listen to speakers on various aspects of robotics. The morning was devoted to constructing Micromouse, and in the afternoon Colne Robotics and Powertran Cybernetics demonstrated and talked about their robot arms.

As a warning to people designing mice, it was announced that a rule may be introduced for the 1983 competition that mice can only touch the tops of walls. Square mice will then no longer be able to use the walls to straighten themselves up: in other words, your mouse must steer itself.

Hex code	Pseudo-mnemonic	Comment
06EF	B←EF	The 0 in bit 4 specifies the top.
0E00	C←00	Might not be necessary.
ED78	IN A, (C)	Read the keys Into the accumulator.
2F	CPL	Complements the accumulator.

Table 1.

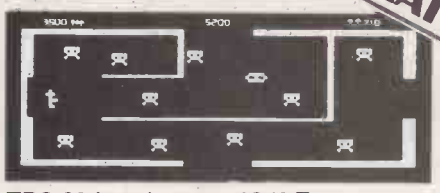
In the more immediate future, the 1982 British Micromouse finals will take place from 23 to 25 April at the Computer Fair, Earls Court, London. Details are available from John Billingsly, Department of Electrical and Electronic Engineering, Anglesea Building, Anglesea Road, Portsmouth PO1 3DJ. The European finals will take place in Israel in September.

The Essential Software Company

47 Brunswick Centre, London WC1N 1AF

ROBOT ATTACK

THE GAME THAT TALKS

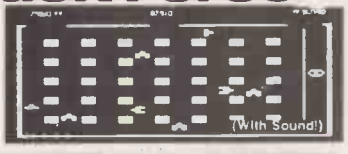


TRS 80 Levels I & II 16 K Tape
Video Genie 16 K Tape

The Newest and Most Astounding Arcade Game that TALKS has just Reached Planet Earth. You can't help yourself. You have to stop them at all cost. Don't let up. Written especially for high quality graphics you'll simply be dazed and excited by the action.

TRS80 VIDEO GENIE

Attack Force



Dodge the alien Ramships and fire missiles to destroy them before they get you. The alien Flagship uses his deadly laser bolt to transform a Ramship into another Flagship or into your ship's double. Look out! Destroy your double and you could destroy yourself.

TRS 80 Level I & II 16K Tape
Video Genie EG3003 16K Tape

Galaxy Invasion

The newest and most exciting invaders type game yet! Cruel and crafty aliens attack Earth. You are the sole defender. As you fire your laser at the aliens they swoop down and bomb you. Exciting use of graphics! Must be seen.

TRS 80 Level I & II 16K Tape
Video Genie 16K Tape

GOBBLE MAN

Your fighter appears below a convoy of Aliens! If you destroy them another set appears who seem to be slightly cleverer than before! Soon your space station nears but before you can dock the station comes under attack! Survival is up to you! The excitement is just beginning!!

TRS 80 Levels I & II 16K Tape
Video Genie 16K Tape

Watch out behind you! As you hurry through the maze collecting modules you score points. But don't let the Gobblemen catch you. If you are crafty, sneek up behind them and neutralise them to gain extra points. Just keep a watch. When they attack you they come in fast. Just don't lose your nerve.

TRS 80 Levels I & II 16 K Tape
Video Genie 16 K Tape

Cosmic Fighter

3-D means that as you wander through the mazes and buildings, full screen graphic display constantly shows your position in a perspective format as though you were actually there! This "rat's eye" view adds an entirely new dimension to adventure.

English language commands can be entered at any time to manipulate your environment.

The command sets are extensive and sophisticated. Dozens of objects are scattered throughout the mazes and buildings. You can pick them up, burn them, throw them, etc. You may need the sword to fight off an ugly little man. Or a steel rod to hold apart crushing walls. Deathmaze 5000 and Labyrinth allow the traditional one and two word commands.

Asylum incorporates our Advanced Language Interpreter which allows full sentence input Deathmaze and Labyrinth over 550 locations! Asylum 1200

SuperNOVA

Now the amazing ASTEROIDS arcade game for your TRS 80! Your ship is floating in the middle of an asteroid belt! Your only escape is to destroy them and the crafty alien spacecraft! Blast them laser, thrust, rotate or hit hyperspace to survive!

All Tapes £10 ea

ASYLUM Tape £12

THE ESSENTIAL SOFTWARE COMPANY
(Viscounti Ltd.) 01-837 3154
47 Brunswick Centre, London WC1N 1AF

I have a ..... microcomputer.
Please send me your software catalogue. I enclose a stamped self addressed envelope.
Please send me .....
I enclose a cheque/postal order for £ .....
(plus 70p post & packing)

Signature .....
Name .....
Address .....
Postcode .....
My ACCESS No is .....

● Circle No. 194

16-Bit Microprocessors

By Johnathon Titus, Christopher Titus, Alan Baldwin, W. N. Hubin and Leo Scanlon. Published by Howard W. Sams, 350 pages, paperback. ISBN 0 672 21805 4.

THIS IS UNLIKELY to be the most stimulating read you have ever had, but if you are about to implement a system based on a 16-bit microprocessor and wish to determine which processor will best suit your purposes then this may well be the book for you.

It represents a survey of the six microprocessors which the authors feel are, or could become, the most popular: the 8086, Z-8001/2, 68000, 9900, LSI-11 and the 16000. It is an attempt to reduce the documentation of each into a manageable form to provide a means whereby the processors may be more easily compared.

After an introductory chapter explaining basic microprocessor concepts there are chapters devoted to each processor, providing information on registers, pointers, addressing, the instruction set, chip hardware, software, benchmarks, interfacing and special function chips. Sources of additional information are given after each chapter.

The authors have used four benchmarks in comparing the processors: bubble sort, ASCII string search, multiply/divide, and look-up table. The specifications are provided in an appendix and program listings are included in the main text.

Information is also provided on suppliers of microcomputer boards and software and there are plenty of tables and schematic diagrams. No attempt is made to determine which is the "best" processor but the concluding section of each chapter suggests suitable applications for that processor.

Conclusions

- **As the authors make clear, this is not a book for beginners. It is aimed at those with experience of 8-bit processors about to move on to 16-bit implementation.**
- **For such a person this survey is a reasonably good starting point.**

Michael Trott

Programming Your Microcomputer in Basic

By Peter Gosling. £3.95. Macmillan Press.

THERE SEEMS to be a never ending stream of books introducing Basic programming. Inevitably there is little to distinguish one from another but occasionally there is one that makes its mark. It may be due to originality of presentation or, as in this case, price.

Peter Gosling has written a book that is clear, concise and in the main accurate. The text is in the usual format of a description of one or two keywords and then a short program to illustrate their function.

In fact the book gives a feeling that it is really intended to accompany a course in Basic programming, even though the preface suggests that it was written to overcome the lack of clarity of many manuals. The suspicion is strengthened when it is realised that the author is a lecturer at a technical college. The book is admirably suited to such a purpose.

Although short, this book covers more of the language than many competitors and also provides several useful routines for common requirements such as sorting and the alignment of decimal values when printing.

Conclusions

- **A straightforward little book which will provide a useful introduction to Basic especially if used in conjunction with the manufacturer's manuals or as a course text-book.**
- **At £3.95 it would be a worthwhile purchase for a newcomer to Basic.**

Martin Wilson

Software Metrics

By Alan J Perlis, Frederick G Sayward and Mary Shaw (editors). £17.50. MIT Press.

IN 1979 the editors of this book were asked to evaluate the current state of the art in software metrics by the U.S. Office of Naval Research. Software metrics is the quantitative measurement of the quality of software. If this goal were attainable then the whole basis of many of the arguments about languages, operating systems and their merits would be changed completely. We would have concrete criteria for evaluating which language was best, which program design techniques were best and what constituted good software.

As the authors admit, the computer-science research community has a very low opinion of software metrics. The idea that it is possible to derive some invariant laws of software, like the laws of physics, is an appealing one. Unfortunately, there is little or no evidence that this is attainable. Software production is a human activity, the psychology of which is as yet unfathomable. The field has not been helped by the lack of a coherent methodology and the poor quality of much of the limited academic research that has been done.

As to the central theme of the text, this is best summed up in a quote attributed to E W Dijkstra on page 92 which simply says "Metrics is crap". This book offers little evidence to the contrary and plenty of confirmation. Unfortunately all the new initiatives suggested are either unworkable or methodologically unsound or both. On the strength of this book software metrics will remain in its current dire state for the foreseeable future.

Conclusions

- **The bibliography is the most useful section of the book.**
- **Given the dubious status of metrics, this book cannot be recommended.**

J Cookson

Using The Radio Shack TRS-80 in Your Home

By Kenniston W Lord Jr; Hardback 457 pages, £18.65. Van Nostrand Reinhold ISBN 0 442 25707 4

WHAT THIS BOOK DOES, it does reasonably well in dealing with programming in level I Basic from novice to competent amateur standard. However, the book must be judged on its rather unexciting presentation and the fact that it is clearly aimed at the American market, making several of the programs inappropriate and in need of much revision.

After an introductory chapter providing a mid-1970s view how computers will be used in the future, and suggesting applications for the home user, comes a chapter misleadingly headed How Computers Work. It does not tell the reader how computers work at all, though it does provide a good extension to the level I handbook, in explaining how to use a TRS-80 covering programming principles, use of variables, arrays, memory, relational operators, subroutines and the use of tape for storing data.

Chapters three and four develop these techiques and explain thoroughly the use of level I screen graphics. Sample programs are provided in both chapters and these are clearly explained. It should be noted that both arrays and graphics in level I are severely limited by today's standards. However, the author provides good advice on how to make the most of the facilities offered.

Chapter six provides programs for a shopping list, skiers wind-chill chart, drinks recipes, central heating oil consumption, household chores, car expenses and two novelty programs. The final two chapters deal with using the TRS-80 for games and a U.S. orientated personal accounts payable system.

The author claims that all the programs work and, most of those that were tried did run first time. He also admits that they could be written in a more efficient fashion. However, he may be right to point out that his style of developmental programming helps the novice to understand the stages more clearly. What is disappointing is the lack of information on control applications which many home users might have found interesting.

Conclusions

- **The limitations of level I Basic are, as the author admits, the real bugbear. However, if you are a novice and cannot afford an upgrade to level II this book will help you to make the most of level I.**
- **A book on TRS-80 Basic programming for £18.65 should be revised for the U.K. market and should either be level II based or provide more information on conversion.**

Michael Trott

★ Complete Installations

★ Staff Training

RAIR BLACK BOX MICROCOMPUTER

EXPANDABLE HARD DISK SYSTEMS - fast delivery
ASK FOR DEMONSTRATION AT YOUR PREMISES

RAIR 3/30 5 Mbyte 64K Microcomputer with 1 Hazeltine Workstation	£ 4,280
RAIR 3/30 5 Mbyte 128K Microcomputer with 2 Hazeltine Workstations	£ 5,810
RAIR 3/30 5 Mbyte 256K Microcomputer with 3 Hazeltine Workstations	£ 7,590
RAIR 3/50 15 Mbyte 256K Microcomputer with 1 Hazeltine Workstation	£ 6,030
RAIR 3/50 15 Mbyte 256K Microcomputer with 2 Hazeltine Workstations	£ 6,560
RAIR 3/50 15 Mbyte 256K Microcomputer with 3 Hazeltine Workstations	£ 7,090
RAIR 3/50 15 Mbyte 256K Microcomputer with 4 Hazeltine Workstations	£ 7,620
RAIR 3/50 15 Mbyte 512K Microcomputer with 5 Hazeltine Workstations	£ 9,400
RAIR 3/50 15 Mbyte 512K Microcomputer with 6 Hazeltine Workstations	£ 9,930
RAIR 3/50 15 Mbyte 512K Microcomputer with 7 Hazeltine Workstations	£10,460
RAIR 10 Mbyte Add on Hard Disk for extra storage	£ 2,500
RAIR Cartridge Tape for fast 5 minute backup	POA
Workstations: IBM, Hazeltine, Tektronik etc.	POA
Printers: Diablo, Qume, NEC, Oki, Texas, Anadex etc.	POA

Lease Purchase. Rentals available from 3 months.

★ Stop Press: ICL now manufacture Rair Black Box under license ★

COMPETITIVE QUOTATIONS FOR SOFTWARE DESIGNED TO YOUR REQUIREMENTS

Examples below include software designed to your own specifications on Rair Black Box Microcomputers:

Invoicing. Integrated with Stock, Sales & Accounts	from £750
Stock. Integrated with Invoicing & Accounts	from £650
Sales. Integrated with Invoicing & Accounts	from £750
Payroll. Integrated with Accounts	from £795
Purchases. Integrated with Stock & Accounts	from £750
Name & Address. Integrated as required	from £550
Accounts. Integrated to Balance Sheet P&L	from £750
Estate Agents Client Matchup	from £550
Printers Estimator	from £950
Associations/Hirers etc. Member Tracker	from £500
Surgeries Patient Controller	from £500
Haulage Loads Sorter	from £500
Solicitors Bookkeeper	from £850
Insurance Brokers Paper Eater. Rentals per month	from £ 65

MAIL ORDER CP/M SOFTWARE

INCLUDING: Black Box. Comart Communicator. Comart Educator. Cromenco. Excidy Sorceror. Gemini. Nascon. ICL. North Star Horizon. Rair. Research Machines. Sharp MX. Superbrain. SD Systems. Transam Tuscan. Vector MZ. 8" IBM Format and others.

BYROM SOFTWARE	
BSTAM-Utility to link one microcomputer to another also using BSTAM	£95 (£6)
BSTMS-Utility to link a micro to a mini or mainframe	£95 (£11)
COMPILER SYSTEMS	
CBASIC v 2.08	£65 (£15)
CREATIVE COMPUTING	
CS-9001 BASIC Games 1	£14
CS-9002 BASIC Games 2	£14
CS-9003 ADVENTURE 1.0	£14
CS-9004 BILINGUAL Original Adventure	£14
CS-9005 BASIC Games 3	£14
CS-9006 BASIC Games 4	£14
PR DALY - INTEGRATED ACCOUNTS	
Name & Address	£200
Stock	£350
Invoicing	£200
Sales	£350
Purchase	£350
General Accounts	£500
Payroll	£350
Time Reloading	£500
DIGITAL RESEARCH	
MPM 1.1	£195 (£20)
MPM 2.0	£250 (£30)
CP/M86	£160 (£27)
CP/M 2.2	£95 (£20)
CP/NET	£120 (£14)
SID	£50 (£14)
ZSID	£55 (£14)
MAC	£60 (£14)
TEK	£50 (£14)
DESPOOL	£55 (£6)
PL/1	£300 (£27)
BT-80	£140 (£20)
TINY-C ASSOCIATES	
Tiny-C language for 8080, 8085, Z80 systems	£55 (£39)
NEW PRODUCTS	
MICROPRO INFOSTAR	TBA
FOX & GELLER QUICKSCREEN	TBA
MICRO AP SELECTOR V	TBA
DIGITAL RESEARCH CB-80	TBA

GRAFFCOM INTEGRATED ACCOUNTS	
Payroll	£500
Sales	£450
Purchases	£450
Stock	£350
General Accounts	£400
Invoicing	£350
Time Recording	£400
HP/Rental/Lease	£400
Name & Address	£200
GRAFFOX ENGINEERING GRAPHICS	
2D & 3D	POA
INFORMATION UNLIMITED	
WHATSIT (Database Management System)	£80
KLH SYSTEMS	
Spooler for CPM systems v3.0	£70 (£6)
MICROFOCUS	
CIS COBOL version 4.4	£400 (£25)
FORMS 2 v11	£100 (£10)
MICROLOGY	
FTNUMB (FORTRAN-80 RENUMBER & REFORMATTER)	£50 (£5)
PEACHTREE	
MAGIC WAND WORD PROCESSOR	£185 (£20)
PHOENIX SOFTWARE ASSOCIATES (For Z80 only)	
PLINK-Disc to disc link loader	£72 (£15)
PASM-Macro Assembler	£72 (£15)
PEDIT-Line editor with Macros	£72 (£15)
BUG-Very powerful debug	£72 (£15)
PDEVELOP Package with all the above	£193 (£33)
PLINK-2 Overlay Link Loader	£185 (£15)
MICROPRO INC.	
WORD-MASTER 1.7A	£75 (£22)
TEX-WRITER 2.6	£37 (£17)
WORDSTAR 3.0	£250 (£38)
MAILMERGE 3.0 (requires Wordstar)	£75 (£10)
SPELLSTAR 1.0 (requires Wordstar)	£125 (£10)
WORDSTAR TRAINING MANUAL	(£18)
WORDSTAR CUSTOMIZATION NOTES	£50
SUPER-SORT 1.6: Version 1	£125 (£22)
Version 2	£110 (£22)
DATASTAR V.101	£175 (£25)
CALCSTAR	£150 (£25)

SUPERSOFT INC.	
DIAGNOSTICS 1	£45 (£9)
DIAGNOSTICS 2	£55 (£9)
TERM	£72 (£7)
TDL SOFTWARE (Technical Design Labs)	
BUSINESS BASIC	£80
ZTEL (Text Editing Lang.)	£35
LINKER	£35
MICROSOFT INC.	
BASIC-80 5.21	£185
BASIC Compiler 5.3	£205
FORTRAN-80 3.43	£260
COBOL-80 4.01	£380
M/SORT 1.01	£75
EDIT-80 2.02	£65
MACRO-80 3.43	£105
MULISP 2.10	£105
MUMATH 2.10	£130
MICROTECH EXPORTS	
REFORMATTER	
CPM—IBM	£98 (£17)
CPM—DEC	£98 (£17)
MT MICROSYSTEMS	
PASCAL MT-5.25	£150 (£25)
PASCAL MT-5.25 with SPP	£265 (£50)
Library Sources	£110
Speed Programming Pkge. (Softbus)	£125 (£25)
RAIR	
Enhances software for Black Box	
MP/M	£250
CP/NET	£150
BASIC-80	£175
BASCOM-80	£225
FORTRAN-80	£275
COBOL-80	£425
PL/1-80	£325
PASCAL-80	£225
MACRO-80	£100
SUPERSORT	£150
MSORT	£100
DATASTAR	£225
BSTAM	£100
BSTMS	£125
WORDSTAR	£275
MERGEPRINT	£100

Prices above are for Software and Manual. Prices in brackets denote Manual only.

MAIL ORDER INFORMATION. Due to price fluctuations please phone for current prices, updates, new releases and Order Information. Payment by Access and Barclaycard welcomed.

Metcalfs

111 HIGH HOLBORN LONDON WC1
TEL. 01-989 0430 TELEX 893959

ALL PRICES SUBJECT TO 15% VAT AND FLUCTUATION.

● Circle No. 195

All the fun of the computing fair by Tony Roberts

AT THE recent Alternative Technology (Computing) Fair there were five stands, arranged in a row opposite the free bar. When I arrived back the boss asked me to tell him about the products — but I find I have a bit of a problem remembering who's who.

I have listed all I can remember:

- The fluorescent yellow machine was next to the one that kept on changing colour which must have been the Chameleon. The Chameleon stand was next to the Beta stand.
- The Audromeda stand was on the end of the row, and stood next to the machine that was driven by clockwork and had the voice-generator that hiccupped.
- None of the machines had more than one input and one output device, or more than one source of power.
- The two with printers were on opposite ends of the row, and one had an optical scanner.

- The wind-powered machine had a liquid-crystal display.
- The elastic-driven machine was having difficulties because of the heat of the adjacent boiler on the steam-driven machine, which was so grimy its colour could not be seen.
- The ones with paper-tape reader, VDU input and output, and a keyboard stood next to each other in that order.
- The red-striped machine had a voice-recognition device and was to the right of the machine with ghastly blue polkadots.

Which machine was solar powered, and how did Epsilon produce its output?

Solution to January puzzle

THE SOLUTION to the Flowchart puzzle, which appeared in the January edition of *Practical Computing*, is that Y is an approximation within ±1 to the square root of X.

Kuma Computers

SYBEX BOOKS BOOKS

279	CP/M Handbook	11.50
316	Intro to Pascal	11.50
23	Micro-Interfacing technqs	13.10
367	Pascal Progs for Scientists & Engineers	12.70
200	Programming the Z-80	11.95
60	Programming the 6502	10.75
280	Your first Computer	7.75
334	Fifty Basic Exercises	10.25
65	Basic Computer Games	5.95
327	Basic ComProgs for Bus Vol.1	8.50
374	Basic for Home Computers	5.30
302	Basic - A self teaching Guide (2nd Ed.)	5.95
171	Basic & Personal Computer	9.95
36	Instant Basic	8.75
161	More Basic Games	6.25
307	Using CP/M - A Self-Teaching Guide	7.50

OSBORNE BOOKS

159	Z-80 Assembly Language Programming	12.10
383	The CP/M Users Guide	10.10
365	The Apple 11 Users Guide	11.50

ZX-81 BOOKS

NEW	Byteing Deepper into your ZX-81	4.95
413	Gateway Guide to ZX-80/81	5.95
385	Getting Acquainted ZX-81	4.95
417	Hints & Tips for ZX-81	4.25
409	Mastering Machine Code ZX-81	5.95
416	Sinclair ZX-81 Prog/Real Applics.	6.95
401	ZX-81 Companion	7.95
404	ZX-81 Pocket Book	5.95
412	Not only 30 Progs ZX-81	6.95

PHONE NOW FOR SHARP HARDWARE AND SOFTWARE

FOR FULL RANGE SEND FOR FREE CATALOGUE

VIC BOOKS

408	Getting Acquainted - VIC20	5.95
415	VIC Revealed	7.00
276	PET Library of Subroutines	10.00
275	PET Revealed	10.00

SHARP

	Beginners Guide MZ-80K	3.95
	MZ-80k Sharp Softwere Techniques	5.95
	MZ-80K Softwere Secrets	5.95

MISCELLANEOUS+ CONSTRUCTIONAL

29	The Cheap Video Cookbook	4.95
347	Son of Cheap Video Cookbook	6.95
24	TTL Cookbook	7.15
187	6502 Assembly Language Programming	13.50
293	Z8000 Assembly Language Programming	15.95
356	6809 Assembly Language Programming	13.50
359	68000 Microprocessor Handbook Kane	5.90
274	The 8086 Book (Inc 8088)	13.50

BASIC GAMES

65	Basic Computer Games	5.50
161	More Basic Games	5.50
289	Basic Computer Programs for the Home	6.50
39	Some Common Basic Programs	11.50
70	Games Playing with Basic	6.15
89	Basic Computer Programs for the Home	6.50

BASIC AND APPLICATIONS

140	Basic Basic	6.75
141	Advanced Basic	6.85
195	The Basic Handbook	11.50
286	Basic Comp Progs in Science & Engin.	6.50
163	Basic Programing Primer	7.95
37	Beginning Basic	8.65
182	Problem Solving and Structured Prog. in Basic	9.40
303	Basic Programming	7.45
332	Basic Business Software	7.05

APPLE BOOKS

Apple Basic Data File Programming, Finkel Brown	8.95
Apple II Users Guide, Poole	11.50
Mostly Basic Applications for your Apple, Berenbon	9.70
Apple Machine Language	9.70
Apple Basic for Business	9.06
Pascal Programming for the Apple	9.70
Computer Graphics Primer	10.45
Apple Pascal Hands on Approach	10.50

NEW

B.B.C. MICRO BOOKS
Practical programs for the B.B.C. Computer & Acorn Atom — 5.95
Plus many more/

Add £1.00 p & p to orders under £10.00.
Carriage free on orders over £10.00 within mainland U.K.
Overseas add 15%
Telephone Orders.
Just give your Credit Card number (Barclay Card or Access) and requirements on our 24 hour 7 day Ansaphone Service.

Kuma Computers
11 York road Maidenhead Berks.
Phone:Maidenhead(0628)71778/9
Telex: 849462 TEL FAC.KUM

● Circle No. 196

HENRY'S COMPUTER KIT DIVISION

TANGERINE COMPUTER SYSTEMS
LONDON & HOME COUNTIES STOCKISTS

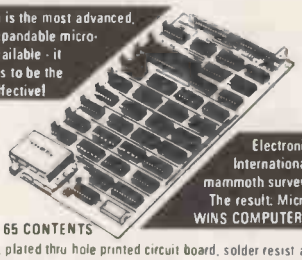
ALL PRE-PAID ORDERS POST FREE

RETAIL SALES & DEMONSTRATIONS 404 EDGWARE RD. LONDON, W2 1ED TEL: 01-402 6822

TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE

MICROTAN 65

Microtan 65 is the most advanced, powerful, expandable micro-computer available - it also happens to be the most cost effective!



Electronic Today International held a mammoth survey of kits. The result: Microtan 65 WINS COMPUTER CLASS!

MICROTAN 65 CONTENTS
High quality, plated thru hole printed circuit board, solder resist and silk screened component identification. 6502 microprocessor. 1K monitor TANBUG. Now with 'V' Bug. 1K RAM for user programme, stack and display memory. VDU alphanumeric display of 16 rows by 32 characters. MICROTAN 65 system file binder. 136 page, bound, users hardware / software manual with constructional details and sample programmes. Logic and discrete components to fully expand MICROTAN 65.

The MICROTAN 65 kit has won widespread acclaim for its superb presentation. We pay attention to detail!

KIT FORM **£69.00** + £10.35 V.A.T., total £79.35.

MICROTAN 65 assembled and tested.
Specification as above, but assembled and fully bench tested by ourselves.
£79.00 + £11.85 V.A.T., total £90.85.

TANBUG V2.3 KIT
(Separately) £21.85 incl.

MICROTAN 65 OPTIONS

LOWER CASE PACK
Two integrated circuits which connect into locations on MICROTAN allowing 128 displayable characters.
£9.48 + £1.42, total £10.90.

MINI MOTHER BOARD
Used to connect Microtan to Tanex
Built **£10.00** + VAT

GRAPHICS PACK
Five integrated circuits which connect into locations on MICROTAN allowing the display of chunky graphics (64 x 64 pixels). What are chunky graphics? Well, imagine a piece of graph paper with 64 squares vertically and 64 squares horizontally, a total of 4096. Each square can be made black on white.
£6.52 + V.A.T. 98p, total £7.50.

20 WAY KEYPAD
Inexpensive means of getting up and running. Uses 'Schoeller' key-switches, and connects to MICROTAN through a 16 pin D.I.L. plug on ribbon cable. Black anodised escutcheon, with TANGERINE legends, finishes off what must be the best value for money keypad available. Available assembled and tested.
£10.00 + V.A.T. £1.50, total £11.50.

*Space Invaders game (for use with keypad only)
£15.22 + V.A.T. £2.28 total £17.50.

POWER SUPPLIES
MPS 1: Input 120 or 240V AC. Output 5 Volts at 3 Amps Regulated. MPS 1 will power both MICROTAN and TANEX fully expanded. Built on the same size printed circuit board as MICROTAN etc. Available as a fully built and tested unit.
£23.00 + V.A.T. £3.45, total £26.45.

X MPSZ +5V 6A, +12V, −5 and −12V switch mode system PSU
£69.13 + V.A.T.

MINI-SYSTEM RACK
We have produced a mini-system rack which accepts MICROTAN 65, TANEX and our mini-mother board. It has an integral power supply, just plug it into the mains and away you go! Finished in TANGERINE/BLACK, it gives your system the professional finish. Front panel access for I/O cables. **AVAILABLE AS AN ASSEMBLED UNIT.**
£56.35 incl.

FULL SYSTEM RACK
For the man that has everything! 19 inch wide system rack which accepts MICROTAN 65, TANEX, TANRAM, SEVEN FURTHER EXPANSION BOARDS, TANDOS and THE SYSTEM POWER SUPPLY. Available in many formats, e.g. Individual front panels, full width hinged front panel, back panel with or without connectors.
£49.00 + V.A.T. £7.35, total £56.35.

MICRON COMPUTER

FULLY BUILT, TESTED, and housed

£395 inc V.A.T. P&P

SYSTEM RACK MICRON £550.00 Incl.

6502 based microcomputer VDU alpha numeric display. Powerful monitor TANBUG. 8K RAM. 32 parallel I/O lines. 2 TTL serial I/O lines. Four 16 Bit counter timers. Cassette interface. Data bus buffering. Memory mapping contol. 71 key ASCII Keyboard, including numeric keypad. Includes power supply. Also includes the first "10K MICRO-SOFT BASIC" available in the U.K. All the usual BASIC commands.

Full manuals Microtan, Tanex, Basic, X Bug.
All **£5.00** each.

TANRAM

AVAILABLE NOW TANRAM - 40K Bytes on one board! Single board of bulk memory offering: 7K Static RAM (2114), and 32K Dynamic RAM (4116). Onboard refresh is totally transparent to CPU operation and is unaffected by normal OMA's. TANRAM fully expands the available address space of the 6502 microprocessor MICROTAN, TANEX and TANRAM together provide 16K RAM, 48K RAM, and 1K I/O - that's a lot of memory and a lot of I/O! Built and tested. TANRAM ASSEMBLED.

40K RAM CARD with 16K DYNAMIC RAM £76 + VAT

CONTENTS High quality plated thru hole printed circuit board, solder resist and silk screened component identification. Full complement of I.C. sockets for maximum expansion. 64 way D.I.N. edge connector. 1K RAM (2114). Data bus buffering. TANRAM users manual.

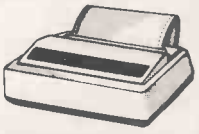
EXTRA RAM:
1K STATIC (2114) £2.95 each. 16K DYNAMIC (4116) £1.50 each.

MEMORIES
EXPAND YOUR SYSTEM WITH OUR TANGERINE APPROVED CHIPS.
Discounts 10% for 4, 15% for 8, 20% for 16.

2102 1K x 1 Static RAM 80p
2708 £3.50
2716 £6.50
MK 4116 16K x 1 Dynamic RAM £1.50
All including VAT
IM 6402 UART £4.50
2114 1K x 4 Static RAM £2.95
4118 1K x 8 Static RAM £7.50

MONITORS (PROFESSIONAL)
RECONDITIONED AND NEW - FROM £35.00 to £129.95

CENTRONICS Ideal for Tangerine PRINTERS



SHEIKOSHA **£199** + V.A.T.
Model 730 **£350** + V.A.T.
Model 737 **£395** + V.A.T.

NEW MICROTANTEL
POST OFFICE APPROVED PRESTEL - VIEWDATA

● FULL COLOURGRAPHICS ● CAN STORE PRESTEL ● CAN BE USED AS AN EDITING TERMINAL ● CAN BE INTERFACED WITH PET, APPLE, and NASCOM

£170 + V.A.T.

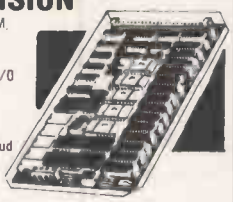
Just connect to the aerial socket of any colour or black and white domestic T.V. receiver and to your Post Office installed jack socket and you are into the exciting world of PRESTEL. Via simple push button use you are able to view 170,000 pages of up to the minute information on many services, order goods from companies - all this without leaving your armchair!

TANEX £43.00
Minimum Config Kit.
+ V.A.T. £6.45, total £49.45.

CONTENTS
High quality plated thru hole printed circuit board, solder resist and silk screened component identification. I.C. sockets for maximum expansion. 64 Way D.I.N. edge connector. 1K RAM, cassette interface, 16 parallel I/O lines, a T.T.L. serial I/O port, two 16 bit counter timers, data bus buffering, memory mapping, logic and discrete components for maximum expansion. TANEX users manual.

TANEX (Minimum configuration) Assembled
£53.00 + V.A.T. £7.95, total £60.95

TANEX EXPANSION



Expanded, TANEX offers: 7K RAM, locations for 4K EPROM (2716), locations for 10K extended MICROSOFT BASIC, 32 parallel I/O lines, two TTL serial I/O ports, a third serial I/O port with RS232/20mA loop, full modem control and 16 programmable baud rates, four 16 bit counter timers, cassette interface, data bus buffering, and memory mapping.

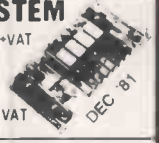
EXPANDED TANEX KIT (Excludes ROM, XBUG and BASIC)
£89.70 + V.A.T. £13.46, total £103.16.

EXPANDED TANEX ASSEMBLED
£99.70 + V.A.T. £14.96, total £114.66.

OPTIONS TO FULLY EXPANDED TANEX
10K Extended MICROSOFT BASIC in EPROM (with manual) £49.00 + V.A.T. £7.35, total £56.35.
Extra RAM - 1K (2 x 2114) £5.20 + V.A.T. 78p, total £5.98.
SERIAL I/O KIT £17.25 Incl.
6522 VIA £8.00 + V.A.T. £1.20, total £9.20.
XBUG £17.35 + V.A.T. £2.60, total £19.95.
± 12V KIT £9.20 Incl.

AS YOU CAN SEE THE PRICES OF OUR EXPANSION COMPONENTS ARE VERY, VERY COMPETITIVE!

TANGERINE DISC SYSTEM



Z80 CONTROLLER CARD **£150.00** + VAT
DOUBLE SIDED DOUBLE DENSITY DRIVE **£215.00** + VAT
CP/M DISK OPERATING SYSTEM **£80** + VAT

71 KEY ASCII KEYBOARD £69.95 incl.
NO EXTRAS NEEDED.
Uses gold crosspoint keys. Includes numeric keypad and ribbon cable. Available as fully assembled and tested.

SUPER METAL CABINET IN TANGERINE/BLACK
£20.00 + V.A.T. £3.00, total £23.00.

PROFESSIONAL ASCII KEYBOARDS
Ideal for Tangerine

£29.95 + VAT

- 52 key 7 bit ASCII coded
- Positive strobe +5V-12V
- Full ASCII characters
- Parallel output with strobe
- Power light on control
- Chip by General Instrument (G.I.) TTL output
- Superbly made
- Size 13 x 5.5 x 1.5 ins
- Black keys with white ledgens
- Escape shift return & reset
- Control repeat & bell keys
- Complete with DATA

ADD-ON KEYPAD

A compact 12 button keypad suitable for use with above keyboard to extend its functions plus four extra keys. Supplied brand new with with data. A 4 x 4 non-encoded single mode keyboard

LIST PRICE £22.00
OUR PRICE **£7.95** + VAT

PLUS MANY NEW EXCITING PRODUCTS IN DEVELOPMENT AUTOMATICALLY AVAILABLE FROM US WHEN RELEASED BY TANGERINE LTD. All products are available FULLY GUARANTEED ● BUY WITH CONFIDENCE BRITISH DESIGN & MANUFACTURE AND ON DEMONSTRATION IN OUR COMPUTER DEPT

NEW PRODUCTS (All VAT incl.)

System Motherboard (4 Connector)	44.85
System Motherboard (12 Connector)	72.85
Extra Edge Connectors	3.50
System Rack Front Panel	15.64
Serial I/O Board Min (2 Ports)	66.70
Serial I/O Board Max (8 Ports)	135.70
Parallel I/O Board Min (16 Lines)	54.63
Parallel I/O Board Max (128 Lines)	99.48
32K Ramcard 16K Version	87.40
32K Ramcard 32K Version	115.00
32K Romboard (Excl Rom)	54.65
AIM/KIM Buffer	54.64
Controller Card Full	138.00
Controller Card Min	69.00
CBUG, Combined Tanbug & XBUG	T.B.A.
2 Port, Serial I/O Kit	T.B.A.
High Resolution Graphics	90.85
Aim TV Interface	79.35

TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE

Stockist Enquiries on headed notepaper to:
COMPUTER KIT LTD. (Principal Distributors in U.K.)
11/12 Paddington Green, London, W2. Tele: 01-723 5095
Telex: 262284 Ref. 1400 TRANSONICS

All orders pre-paid and official advertised here to be forwarded DIRECTLY to
COMPUTER DEPT., 11/12 PADDINGTON GREEN, LONDON W2

SEND FOR FREE BROCHURE

● Circle No. 197

A price list

REF	MAKER	QUALITY	SQ.M.	SQ.YD.	FL	PILE YARN
1	WR	ADVANTAGE	19.72	16.49	Y	100% ACRILAN
2	JC	ALPHA	16.77	14.02	Y	100% ACRILAN
3	JH	ANDROS	4.28	3.58	Y	100% NYLON
4	LC	APPLAUSE	12.51	10.46	Y	80%POLYESTER/20%NYLON
5	CM	ARENA	16.73	13.99	Y	80%ACRYLIC/20%NYLON
6	WR	ARROW TWIST	12.16	10.17	Y	100% ACRILAN
7	JH	ASHLEY	9.75	8.15	Y	100% NYLON
8	CM	ASTOR	13.46	11.25	Y	80%ACRYLIC/20%NYLON
9	WR	ATLANTIC	16.13	13.49	Y	100% ACRILAN
10	BM	AXMOR	14.49	12.12	Y	40/40/20-WOOL/EVLAN/NYLON
11	BM	BALMORAL	15.08	12.61	Y	50%WOOL/50%POLYPROPYLENE
12	WR	BASSETT	19.08	15.95	Y	80%WOOL/20%NYLON
13	LC	BATHROOM BLISS	12.51	10.46	Y	80%POLYESTER/20%NYLON
14	LC	BLISS	9.49	7.93	Y	80%POLYESTER/20%NYLON
15	WR	BROADLANDS	10.09	8.44	Y	100% POLYESTER
16	JC	CABARET	6.61	5.53	Y	100% NYLON
17	LC	CACHET	7.33	6.13	Y	100% POLYPROPYLENE
18	JC	CAIRNGORM	7.38	6.17	Y	100% NYLON

from a Pet

The tedious, repetitive and costly task of keeping a carpet warehouse abreast of rising prices has been handed over to a micro. Mervyn Axon tells the story of how it was done.

IN ANY BUSINESS it is important for the staff to have an up-to-date price list. Maintaining these lists can be a very time-consuming task, particularly under the inflationary conditions of the last few years, and continual amendments can introduce expensive errors.

The problem described here concerns a carpet price list in a retail furniture business. A number of stock lines are carried, presenting no great difficulties, but in order to offer the widest possible selection to customers, the firm holds a large number of samples, from which special orders can be obtained as required. These come from about a dozen suppliers, each of which offers up to 15 different qualities, all at varying prices.

The price list contains details of approximately 150 items, including:

- Reference number,
- Code for the supplier,
- Quality name,
- Retail price per square metre,
- Comparative price per square yard,
- Whether or not the supplier is an approved supplier,
- Composition of the pile yarn.

Both prices are required because the trade has gone metric, while most customers still prefer imperial measures.

Once the initial list has been prepared, a number of copies are made for salesmen, offices, etc. Three possible updates are required:

The supplier's price could be changed. The mark-up required and VAT must be added to the new price to give the metric price; multiplying this by 0.8361 gives the imperial price.

A quality could be withdrawn.

A new quality could be introduced. Full details then have to be inserted in the correct alphabetical position.

None of this is difficult to carry out, but it is very tedious and time-consuming, particularly since amendments can arrive from suppliers at any time.

It is not satisfactory simply to alter the existing lists by hand. The whole of the master list must be retyped each time and then carefully checked to ensure that no new errors have been introduced. New price lists arrive from suppliers every few days, so the whole process must be repeated frequently.

Choice of hardware

Though this is just the sort of task that could be carried out most efficiently by a microcomputer, no commercially-available program could be found in 1978, when it was decided to computerise the price list. The hardware selected was an 8K Pet with calculator-type keyboard and a built-in cassette recorder, together with an external cassette recorder — disc drives were not available at that time — and a Teletype 43 printer with a suitable interface.

The first step in developing the software was to store the initial data on a cassette tape in the form of a file. This was done by entering the data as a program as

(continued on next page)

SHOPWINDOW

BUDGET COMPUTER SALES
in
WEST YORKSHIRE

TRS80 Model III	£
with built in drives	1384.00
Twin TEAC drives	390.00
Single TEAC drives	236.00
Teac Scripta KSR	£798
Epson MX100	550.00
Diskettes	from 1.55

12 Month Warranty
Prices Exclude VAT

AMBASSADOR BUSINESS COMPUTERS
For Sales, Service, Help
ASHLEY LANE WORKS, SHIPLEY, BD17 7SL. Tel: (0274) 595941

● Circle No. 198

TRS 80 and GENIE Owners
Still Paying High Software Prices?
You should be taking
CLOAD MAGAZINE
America's monthly cassette of at least 6 programs
Cload caters for all tastes: Arcade Games, Adventures, Utilities, Tutorials and even Business programs. Over 5,000 copies sold each month.
Trial cassette £4.95
6 month subscription £25.00
12 month subscription £47.50
Over 40 back issues available.
Send for lists from the sole agents in the U.K.
MICRODEAL, Deal House, Luxulyan, Bodmin, Cornwall. Tel: 0726 850821

● Circle No. 199

APPLE/VISICALC OFFER

Apple 48K Europlus	£695
Disc drive with controller	£350
12" green monitor	£120
Silentype printer	£182
Visicalc 3.3	FREE

Items sold separately. — VAT extra.

Phone or write:
ADVANCED BUSINESS COMPUTERS
Commercial Buildings, 15 Cross St, Manchester 2. 061-835 1477.

● Circle No. 200

SHOPWINDOW

WESTERN
Western Computers Limited
apple
comart
North Star Horizon
Cromemco
PLEASE CONTACT US FOR DETAILS
Blackpool Airport,
Blackpool, Lancs.
Phone Blackpool 404676/42660
● Circle No. 201

ACORN ATOM UTILITY ROM
£29.90
The Willow Software 4K Utility ROM simply plugs into the spare utility ROM socket in your Atom and provides 18 powerful new commands and facilities including: Renumber, Range delete, Find, Auto line numbers, Program compression, Disassembler, True keyboard scanning, Memory dump, Variable dump, Register dump, Keyboard sounder, and much more. The Utilities make the Atom easier to use, and provide a 'toolkit' of facilities for program development in both Basic and Assembler. The ROM Utilities are professionally written and fully tested. All standard Atom facilities are unaffected and no textspace memory is used.
Due to increased demand, we are now able to offer the Utility ROM with full instruction manual at the reduced price of only £29.90 inclusive — post free. Send cheque/PO now for delivery by return of post, or write for further details. Official orders and Dealer enquiries welcome.
WILLOW SOFTWARE
PO Box 6, Crediton, Devon EX17 1DL
● Circle No. 202

80 X 24 VDU
Assembled and tested printed circuit board provides the electronics part of a 24 lines by 80 characters Visual Display Unit for any computer with RS232 interface.
Microprocessor based — 55 software selectable functions — 16 baud rates to 9600 baud — X, Y cursor addressing — 96 ASCII (true descenders) 32 graphics characters (continuous) 8x12 matrix — character generation in Eprom — real CTRL-G bleep — requires ASCII encoded keyboard and video monitor (U.K. standard).
VDU-1 Assembled and tested P.C.B. £135
PSU-1 Power supply (for above) £32
All prices subject to £2 Registered Delivery, plus VAT.
We also sell SS-50 printed circuit boards (memory, graphics, prototyping, clock, sound synthesiser)
Send 20p stamps for further Information.
SIRIUS CYBERNETICS LTD,
7 EUSTON PLACE, LEAMINGTON SPA,
WARWICKSHIRE.
TEL: (0926) 316110.
● Circle No. 203

(continued from previous page)

in listing 1. The process was repeated until all the data had been input, when the closing sequence was entered:

```
1000 PRINT 1, 0
1001 PRINT 1, "XX"
1002 PRINT 1, "END"
1003 PRINT 1, "XX"
1004 PRINT 1, "XX"
1005 PRINT 1, 0
1006 CLOSE 5
```

A blank cassette was loaded into recorder 1 and the program was run to create the initial file.

Having stored the price-list data on a cassette, the next step was to write a program to print it out. Note that operating instructions are given on the VDU — see listing 2.

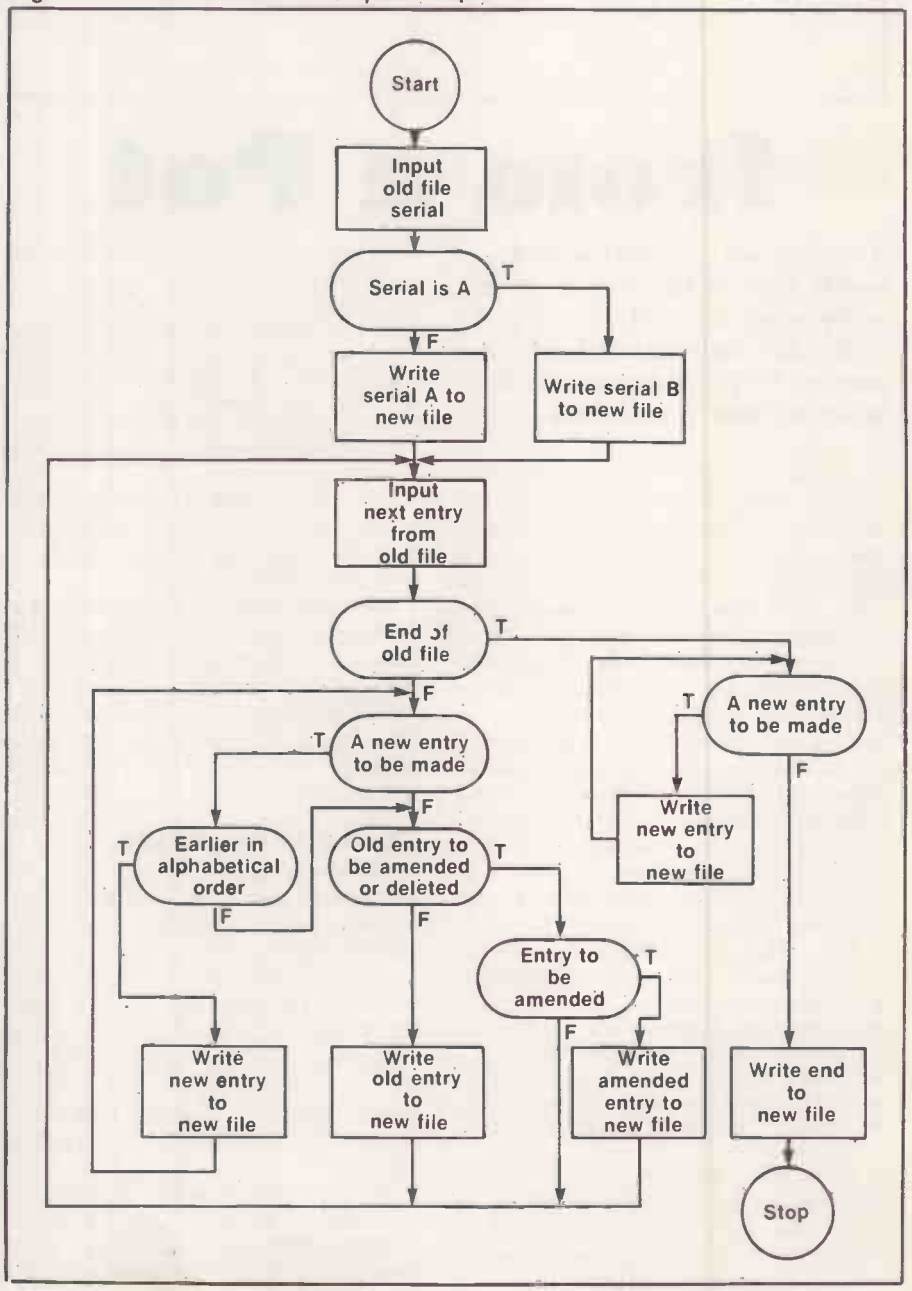
Some formatting of the output is required to produce an easily-readable and well laid-out list, which should preferably be in a convenient-sized page format rather than an continuous sheet. The head of this article shows the output from the system.

The principle used for updating the files is similar to that used for creating them. The original data file, serial A, is updated to produce a new data file, serial B.

Amending entries

The first entry on file A is loaded from cassette recorder 1 and displayed on the screen. It can then be inspected, and any necessary amendments are entered through the keyboard. The entry is then written to a new cassette in recorder 2, creating the new updated file B. The operation is then repeated until all the entries have been dealt with. Read/write operations with cassettes are slow, and an update usually affects 10 percent or less of the file entries, so the update program is divided into two parts to reduce the time spent creating the new file.

Figure 1. Flowchart of automatic update sequence.



Listing 1.

```
100    OPEN 5,1,0              Opens file 5 to read on 1
110    OPEN 6,4,1              Opens file 6 to write on printer
120    INPUT "TYPE TODAYS DATE IN FORM XX.XX.XX"; B1$
130    INPUT "MARK-UP REQUIRED"; U
140    INPUT 5, M$             File serial reference.
150    PRINT 6, "REF", "MAKER", "QUALITY", "SQ.M", "SQ.YD.","FL", "PILE YARN"
160    INPUT 5, E,D$,E$,F$,G$,F
170    IF E$ = "END" THEN 220
180    LET F1 = F*U
190    LET F2 = F1*0.8361
200    PRINT 6, E, D$, E$, F1, F2, F$, G$
210    GOTO 160
220    PRINT 6, B1$, "FILE ";M$
230    PRINT "FINISHED"
```

Listing 2.

```
10     OPEN 5,1,1              Opens a file called 5 on cassette 1 to write.
15     PRINT 1,"A"             File serial reference.
20     PRINT 1, 1              Entry reference number.
21     PRINT 1, "WR"           Suppliers code.
22     PRINT 1, "ADVANTAGE"    Quality name
23     PRINT 1, "Y"            Is a group supplier
24     PRINT 1, "100% ACRILAN" File Yarn
25     PRINT 1, 13.15          Cost price per square metre
```

The main update program appears in listing 3.

Lines 100 to 290 contain data and instructions to set up the operation, the first part of which is in lines 300 to 530.

Initially this requests the reference numbers of entries to be amended or deleted and stores them in array C(B) — line 410.

If the entry is to be amended, the new cost price is stored in an array D(B) — line 510.

The program then goes on to request details of any new entries which are stored in arrays O$(N), P$(N), Q$(N), R$(N) and Q (N) — lines 660 to 700.

The other lines in this section are mainly concerned with validating the inputs and giving instructions to the operator on procedure, the exceptions being lines 370 to 380 which form a loop used to display the instruction in lines 350 to 360 for a reasonable period.

Print CHR$(147) is the Clear Screen instruction.

Since the data on a cassette tape can only be accessed in serial form, the reference numbers of entries to be amended or deleted must be entered in ascending numerical order and new entries must be entered in alphabetical order. Entering the changes only takes a few minutes, after which the operator can leave the machine to create file B. The flow chart of this operation — see figure 1 — describes the procedure, which is coded in lines 1020 to 1720.

Number reference

Variables G and S are needed to keep the reference numbers of the entries in the new file in sequence. G counts the number of deletions made and S the number of new entries. Suppose the reference number E of the current entry from the old file is 100, and that prior to this four deletions have been made and six new entries inserted, then E – G + S is interpreted as 100 – 4 + 6 = 102, which is the reference number to be written to the new file.

File serials alternate between A and B — lines 1090 and 1100 — they could just as easily have run from A to Z and then reverted to A to start the sequence again. Simply change the lines to:

```
1090 LET X = ASC(M$) + 1
1100 IF X = 91 THEN X = 65
```

Lines 750 to 1010 are included as a matter of convenience: they give a printout of the alterations made to the file which can be kept as a permanent record the alterations which have been made.

A small snag was encountered while creating the initial data tape, caused by the 8K memory capacity. Each entry requires about 80 bytes of store, so the full list of 150 entries could not be held in store at the same time. This was overcome by only entering the first 80 records before running the program to create a preliminary file which was then used in conjunction with the update program to complete the initial file. DIM C(50) and DIM D(50) were temporarily removed from line 280 of the update program and the remaining Dim statements changed to C$ (80), etc. to allow this operation to be carried out.

Listing 3.

```
100 PRINTCHR$(147)
110 PRINT"UPDATE CARPET PRICE LIST - MJA250180
120 PRINT
130 INPUT"TYPE TO-DAY S DATE IN FORM XX.XX.XX";B1$
140 IF LEN(B1$)<>8 THEN PRINT "ERROR":GOTO 130
150 PRINT
160 PRINT
170 PRINT"LOAD CURRENT FILE IN CASSETTE 1"
180 PRINT"AND NEW FILE IN CASSETTE 2"
190 PRINT
210 PRINT"PRESS DATA KEY ON TELETYPE"
220 PRINT
230 PRINT"TYPE 1 WHEN YOU ARE READY"
240 INPUTZZ
250 OPEN5,1,0
260 POKE243,58:POKE244,3
270 OPEN6,2,1
280 DIMC(50),D(50),C$(50),O$(50),P$(50),Q$(50),R$(50),Q(50)
290 PRINTCHR$(147)
300 PRINT"TYPE TOTAL NUMBER OF ENTRIES TO BE"
310 PRINT"AMENDED OR DELETED. (LESS THAN 50)."
320 INPUT A
330 IFA>49 THEN 00310
340 IFA=0 THEN 00540
350 PRINT"TYPE REF NOS IN SERIAL ORDER AS EACH"
360 PRINT"IS REQUESTED."
370 FOR I=1 TO 1200
380 NEXTI
390 FORB=1 TO A
400 PRINTCHR$(147)
410 INPUT"SERIAL NO ";C(B)
420 IFC(B)=<C(B-1)THENPRINT"ERROR":GOTO00410
430 PRINT"IS THIS TO BE AMENDED OR DELETED ?"
440 PRINT"TYPE A OR D."
450 INPUT C$(B)
460 IF C$(B)="A" THEN 00500
470 IF C$(B)="D" THEN 00520
480 PRINT"ANSWER NOT UNDERSTOOD."
490 GOTO 00430
500 PRINT"TYPE IN NEW PRICE PER SQ.M."
510 INPUT D(B)
520 NEXT B
530 PRINT"ENTRIES COMPLETED"
540 PRINT
```

(continued on next page)

SHOPWINDOW

UK101 SOFTWARE ON TAPE
from the guy who wrote "La Passe Temps"
GALACTIC HITCHHIKER (8K) An Adventure, all in machine code. A beauty! **(£7.00)**
SUPERTREK (8K) Sail boldly through the universe zapping moving Klingons in real time. Superb graphics. **(£7.00)**
LUNAR LANDER A real challenge. You won't get down in less than three hours. **(£3.00)**
LE-PASS-TEMPS This is what a computer game SHOULD be like **(£3.00)**
STARTREK (8K) The old favourite, beautifully presented. Not real time but great graphics nonetheless **(£6.00)**
• NEW •
Please phone for details of the exciting range of TAQWA ADD ONS:
Others available include a BASIC TUTOR (8 × 4K Programs) £12.00 and lots more games.
Each program comes on its own cassette by return 1st Class Mail. Available for 16 × 48 or 32 × 48 display and compatible all monitor ROMs. All inclusive from:
A. KNIGHT (DEPT PC)
28 SIMONSIDE WALK, ORMESBY, CLEVELAND
Tel: (0642) 321266

● Circle No. 204

apple®
ACORN
Atom & BBC
Your local Fruit and Nut
NORTHERN COMPUTERS
Churchfield Rd, Frodsham,
Warrington WA6 6RD.
0928 35110

● Circle No. 205

COMMODORE PETS

4032 Computer	£550
4040 Disk	£550
3022 Printer	£340

Subject to Stock
VAT Extra

BRACKNELL COMPUTERS
Crossway House, Bracknell, Berks
(0344) 52929

● Circle No. 206

ASSEMBLY LANGUAGE for PET VIC
PET from 8K: VIC 20 from 3.5K
Both books cover WHOLE 6502 Instruction set, AND CONTAIN
FULL 6502 ASSEMBLER
PRICES: 2/3/4000 PET & VIC BOOK £10
ALL PET & VIC: book + ASSEMBLER — ON TAPE £15: ON DISK £17.
VIC BOOK CONTAINS **M/C LANG MONITOR**
SAE details from: DR P HOLMES (P)
21 Colin Drive
State Machine. LONDON NW9 6ES

● Circle No. 207

SHOPWINDOW

TEL:
01-337 4541

PET PARTS

EASIVIEW COPYHOLDER £24.00 plus V.A.T.
Fitted to any model PET in seconds. No tools required.
EPROM PROGRAMMER For all 5V. Eproms.
Own power supply and user port connector.
CONCORDIA AUTOMATION COMPONENTS LTD.
6 Central Road, Worcester Park, Surrey.

● Circle No. 208

DISCOUNT MICROS IN THE NORTH

HARDWARE, SOFTWARE, AND SYSTEMS SUPPORT

PHONE
IMPACT COMPUTERS (0532) 663006

● Circle No. 209

ZX81 16K RAM Expansion Pack
Quite simply, good value for money at £34.50p, including VAT, plus £1.50p p&p.
Junior Maths Pack 1, to run on 1K RAM ZX81 — 5 helpful programs on cassette for £5.75 inc.
CEL CUSTOMISED ELECTRONICS LIMITED
WINKER GREEN MILLS
STANNINGLEY RD
ARMLEY, LEEDS LS12 3BB
Tel: 0532 792332
and 155 MARTON ROAD
MIDDLESBROUGH, CLEVELAND TS4 2EN
Tel: 0642 247727.
VIC 20 — RAM EXPANSION PACKS
Prices on application

● Circle No. 210

ZX80/81 INTERFACE
At last — a well designed interface that allows you to use the ZX80 or ZX81 as a controller.
It provides:
- 24 programmable I/O lines.
- Units can be daisy chained up to 96 I/O lines.
- Can be used in Basic or machine code.
- Screw terminals and ribbon cable header provided.
- Design eliminates mechanical linkage problems.
- Provision for external power supply.
- Does not interfere with Sinclair expansion units.
- Detailed notes and software provided.

£45.00 PLUS V.A.T.
Cheque with order please to:
BYTRONIC ASSOCIATES
88 RUSSELL BANK ROAD
SUTTON COLDFIELD, WEST MIDLANDS B74 4RJ
Tel: 0675 81448
Bytronic Associates also provide a wide range of equipment for learning how to use micros as controllers, e.g. steppers, DC motors, ADC, DAC, pneumatic units etc.
Brochure available on request

● Circle No. 211

(continued from previous page)

```
550 PRINT"HOW MANY ADDITIONS TO BE MADE ? (NOT MORE THAN 50)."
560 INPUTM
570 IF M>49 THEN 00550
580 IFM=0 THEN 00730
590 PRINT"ARRANGE THE ENTRIES IN ALPHABETICAL"
600 PRINT"ORDER."
610 PRINT"ENTER THE DETAILS AS REQUESTED."
620 PRINT"TYPE 1 WHEN YOU ARE READY."
630 INPUTZY
640 PRINTCHR$(147)
650 FOR N=1 TO M
660 INPUT"MAKER";O$(N)
670 INPUT"QUALITY NAME";P$(N)
680 INPUT"PILE YARN";Q$(N)
690 INPUT"FLOREAT - Y OR N";R$(N)
700 INPUT"COST PRICE PER SQ.M.";Q(N)
710 PRINT
720 NEXTN
730 PRINT"ENTRIES COMPLETED."
740 OPEN1,4
750 PRINT#1,"ALTERATIONS MADE TO FILE ON ";B1$
760 PRINT#1:PRINT#1:PRINT#1
770 IF B=0 THEN 00880
780 AA=3
790 FOR B = 1 TO A
800 PRINT#1,"REF ";C(B);
810 IF C$(B)="A"THEN 00840
820 PRINT#1,TAB(10);"DELETED":AA=AA+1: NEXT B
830 GOTO 00860
840 PRINT#1,TAB(10);"C.P. AMENDED TO ";D(B):AA=AA+1
850 NEXTB
860 PRINT#1
870 AA=AA+1
880 IF N=0 THEN 00990
890 FOR N = 1 TO M
900 PRINT#1,P$(N);" ADDED TO LIST. ";
910 PRINT#1,"MAKER ";O$(N);".  PILE YARN ";Q$(N);
920 PRINT#1,".  CP PER SM ";Q(N);".  ";
930 IF R$(N)="N"THEN 00960
940 PRINT#1,"FLOREAT."

950 GOTO 00970
960 PRINT#1,"NOT FLOREAT."
970 AA=AA+1
980 NEXT N
990 FORAB=1 TO (47-AA)
1000 PRINT#1
1010 NEXT AB
1020 PRINT#1,CHR$(147)
1030 PRINT"THE FILE WILL NOW BE UPDATED."
1040 B=1
1050 N=1
1060 G=0
1070 S=0
1080 INPUT#5,M$
1090 IFM$="A"THEN M$="B":GOTO 01110
1100 IFM$="B"THEN M$="A"
1110 PRINT#6,M$
1120 INPUT#5,E,D$,E$,F$,G$,F
1130 IFE$="END"THEN 01460
1140 W=E
1150 IF N>M THEN 01170
1160 IF E$>P$(N)THEN 01370
1170 IF E=C(B)THEN 01250
1180 PRINT#6,E-G+S
1190 PRINT#6,D$
1200 PRINT#6,E$
1210 PRINT#6,F$
1220 PRINT#6,G$
1230 PRINT#6,F
1240 GOTO 01120
1250 IF C$(B)="D" THEN 01340
1260 PRINT#6,E-G+S
1270 PRINT#6,D$
1280 PRINT#6,E$
1290 PRINT#6,F$
1300 PRINT#6,G$
1310 PRINT#6,D(B)
1320 B=B+1
1330 GOTO 01120
1340 G=G+1
1350 B=B+1
1360 GOTO 01120
1370 PRINT#6,E-G+S
1380 PRINT#6,O$(N)
1390 PRINT#6,P$(N)
1400 PRINT#6,Q$(N)
1410 PRINT#6,R$(N)
1420 PRINT#6,Q(N)
1430 N=N+1
1430 N=N+1
1440 S=S+1
1450 GOTO 01150
1460 IFN=<M THEN 01480
1470 GOTO 01590
1480 E=W-G+S+1
1490 FOR V=N TO M
1500 PRINT#6,E
1510 PRINT#6,O$(N)
1520 PRINT#6,P$(N)
1530 PRINT#6,Q$(N)
1540 PRINT#6,R$(N)
1550 PRINT#6,Q(N)
1560 N=N+1
1570 E=E+1
1580 NEXT V
1590 PRINT#6,0
1600 PRINT#6,"XX"
1610 PRINT#6,"END"
1620 PRINT#6,"XX"
1630 PRINT#6,"XX"
1640 PRINT#6,0
1650 CLOSE5

1660 CLOSE6
1670 PRINTCHR$(147)
1680 PRINT"FILE NOW UPDATED"
1690 PRINT"REWIND BOTH CASSETTES"
1700 PRINT"STORE CASSETTE 1 AS 'OLD FILE'"
1710 PRINT:PRINT"STORE CASSETTE 2 AS 'CURRENT FILE'"
1720 PRINT:PRINT:PRINT"FINISHED"
```

The Unix road to power

Unix is pretender to the throne of the most-used operating system whose present incumbent, CP/M, has ruled virtually uncontested for the last two years. Before modular Unix can overthrow this reign, it must improve the image it presents to the user — or so argues Donald Norman.

UNIX was developed by Dennis Ritchie and Ken Thompson of Bell Laboratories. Unix is trademarked by Bell and is available under licence from Western Electric. Although it is a relatively small operating system, it is quite powerful and general. It has found considerable favour among programming groups, especially in universities, where it is primarily used with DEC computers — various versions of the DEC PDP-11 and the Vax.

The operating system and its software are written in a high-level programming language called C, and most of the source code and documentation is available on-line. For programmers, Unix is easy to understand and to modify.

Hierarchical structure

For the non-expert programmer, the important aspect of Unix is that it is constructed from a small, basic set of concepts and programming modules, with a flexible method for interconnecting existing modules to make new functions.

All system objects — including all I/O channels — look like files. Thus, it is possible to cause input and output for almost any program to be taken from or to go to files, terminals, or other devices, at any time, without any particular planning on the part of the module writer.

Unix has a hierarchical file structure. Users can add and delete file directories at will and then "position" themselves at different locations in the resulting hierarchy to make it easy to manipulate the files in the neighbourhood.

The command interpreter of the operating system interface — called the "shell" — can take its input from a file, which means that it is possible to put frequently used sequences of commands into a file and then invoke that file just by typing its name, thereby executing the command strings.

In this way, the user can extend the range of commands that are readily available. Many users end up with a large set of specialised shell command files. Because the shell includes facilities for passing arguments, for iterations, and for conditional operations, these "shell programs" have many uses, essentially calling upon all system resources — including the editors — as subroutines. Many non-programmers have discovered that they can write powerful shell programs, significantly enhancing the power of the overall system.

Modular concept

By means of a communication channel known as a pipe, the output from one program can easily be directed — piped — to the input of another, allowing a sequence of programming modules to be strung together to do some task that in other systems would have to be done by a special-purpose program. Unix does not provide special-purpose programs. Instead, it attempts to provide a set of basic software tools that can be strung together in flexible ways using I/O redirection, pipes, and shell programs.

Technically, Unix is just the operating system. However, because of the way the system has been packaged, many people use the name to include all of the programs that come on the distribution tape.

(continued on next page)

SHOPWINDOW

A T NEW M

DEFENDER: You defend the planet against UFO's, fast moving, Hi Res Graphics, Sound effects, Thrust, Laser Torpedo, Climb, Descend, superbly detailed, G4+T5, £4.00.
ASTRO BATTLE ZONE: Fastened in the cockpit of your starcruiser, you view the 3D graphics of the earth revolving silently below, staring down your Head up display you suddenly glimpse the enemy hurtling towards you, you turn at them, the horizon rolls over, the engines roar as you climb to the stars . . . G4+T5 £5.00.
FRUIT MACHINE: Our version, has Hi Res graphics, nudge, collect, respin, gamble and even plays "Oranges and lemons" when you win! G3+T5 £4.00.
POLECAT: Country Packman, you must move your Rabbit through the underground maze, but you are being chased by a polecat so you must run like a rabbit until you've collected all your carrots growing on the top of the burrow. G4+T5 £5.00
MINEFIELD: You must steer your way through a perilous minefield without exploding any mines, blasting mines can cause chain reactions. G0+T5 £5.00.
EARLY WARNING: Atomic Missile Command, destroy the attacking ICBMs using a realistic radar screen and interceptor missiles. G4+T5 £5.00.
NB G=Graphics T=Text

★ **ANY 3 ONLY £9.00** ★

CONTROL TECHNOLOGY
39 GLOUCESTER RD, GEE CROSS, HYDE, CHESHIRE SK14 5JG

● Circle No. 212

COMPUTER PARK 82
JULY 31 – AUGUST 6 1982

INTERESTING, FUN, EXCITING, EDUCATIONAL

INTERESTED IN MICRO-COMPUTERS?
then
COMPUTER PARK '82

Is the holiday for you. Join other computer enthusiasts for a week of fun and fascination with micros. Catering for all interests, we have assembled a wide range of computers and peripherals to create an exciting computer holiday.
Experiment with:

ROBOTICS PROGRAMMABLE RAILWAY LAYOUT GRAPHICS UNITS SPEECH SYNTHESIS LIGHTING CONTROLLERS ELECTRONIC MUSIC

Our excellent computing facilities are supplemented by a wide variety of other interesting indoor and outdoor activities. Suitable for all ages from 10 years upwards. Residential from 31 July to 6 August in a beautiful Northants country house.

For further details write to:

EDSOFT, 9 LITTLE OAKLEY, CORBY, NORTHANTS NN18 8HA.

● Circle No. 213

VIC 20 domestic cassette interface.
Why purchase a special cassette deck at twice the price when you can use our interface on your existing home cassette player? £19.55 inclusive of VAT plus £1.50 p&p.
VIC 20 3K, 8K and 16K RAM expansion pack at £24.50, £51.75 and £74.75 respectively, including VAT plus £1.50 p&p each.
The 3K attaches to the 16K RAM pack to give 19K RAM.
The 8K RAM pack may easily be expanded to the 16K by the simple insertion of additional I.C.s, as the sockets are provided on board in the price.

CEL CUSTOMISED ELECTRONICS LIMITED
Winker Green Mills, Stanningley Road, Armley, Leeds LS12 3BB
Telephone: 0532 792332
155 Marton Road, Middlesbrough, Cleveland TS4 2EN
Telephone: 0642 247727

● Circle No. 214

SHOPWINDOW

apple

QUME
EPSON
ANADEX
DYSAN

All Business Applications
Full Personal Attention

Hugh S. O'Neill Computers
111 High Street, Selsey,
CHICHESTER, SUSSEX.
Tel. Selsey (024361) 5856

● Circle No. 215

COST ACCOUNTING PURCHASE & SALES LEDGERS
CASH POSTING with DISCOUNTS
INVOICE, STATEMENT, etc. on your own stationery
AGED DEBTORS & DUE FOR PAYMENT report
WAGES ANALYSIS — STOCK CONTROL
NOMINAL LEDGER with JOURNAL entries — TRIAL BALANCE
PROFIT & LOSS — BALANCE SHEET

Don't let the computer dictate how you run your business! Get an integrated system designed to your particular needs — it will only cost about the same as a standard package.

ELECTRONIC AIDS
(Tewkesbury)
Mythe Crest, The Mythe, Tewkesbury,
Glos. GL20 6EB
Phone: (0386) 831020 or (0684) 294003

● Circle No. 216

SEARCHING FOR 'BEST PRICE' . . .
FOUND 'BEST PRICE' . . GOTO

PET		RRP	OUR PRICE
4016	16K	£550	£467
4032	32K	£695	£590
8032	32K	£895	£760
8096			£935
DISK DRIVES			
4040	343K	£695	£590
8050	1M	£895	£760
PRINTERS			
4022	80COL	£395	£335
8024	132COL	£1160	£986
8026	DAISY	£995	£845

VAT to be added @15%
Carriage — £5 per item
If you know what you want why wait? These are the prices you need

ORCHARD COMPUTER SERVICES
Orchard House, 21 St. Martins St.,
Wallingford, Oxon.
Tel. Wallingford (0491) 35529
Open 6 days per week.

● Circle No. 217

(continued from previous page)

Many people have found it easy to modify the Unix system and have done so, which has resulted in hordes of variations on various kinds of computers.

The "standard Unix" discussed here is BTL Unix version 6 May 1975. The Fourth Berkeley Edition of Unix is more or less derived from BTL Unix version 7 September 1978 — with considerable parallel development at the University of California, Berkeley and some input from other BTL Unix versions. I am told that some of the Unix's failings raised in the article have been remedied; however, version 6 is still used by many people.

It may be difficult to discern that I am a friend of Unix. The negative tone should not obscure the beauty and power of the operating system, file structure, and the shell. Unix is indeed a superior operating system. I would not use any other.

Some of the difficulties detailed result from the fact that many of the system modules were written by the early users of Unix, not by the system designers. Many individual idiosyncrasies have entered the system.

For all of its virtues as a system — and it is indeed an elegant system — Unix is a disaster for the casual user. It fails both on the scientific principles of human engineering and even in just plain common sense.

If Unix is really to become a general system, then it must be improved. I urge correction to make the elegance of the system design be reflected as friendliness towards the user, especially the casual user. Although I have learned to accept the vagaries of Unix's user interface, our secretarial staff persists only because we insist.

Crucial failings

Even I, a heavy user of computer systems for 20 years, have had difficulties: copying the old file over the new, transferring a file into itself until the system collapsed, and removing all the files from a directory simply because an extra space was typed in the argument string. The problem is that Unix fails several simple tests.

Consistency. Command names, language, functions and syntax are inconsistent.

Functionality. The command names, formats, and syntax seem to have no relationship to their functions.

Friendliness. Unix is a recluse, hidden from the user, silent in operation. The lack of interaction makes it hard to tell what state the system is in, and the absence of mnemonic structures puts a burden on the user's memory.

What is good about Unix? The system design, the generality of programs, the file structure, the job structure, the powerful operating system command language — the "shell". Too bad the concern for system design was not matched by an equal concern for the human interface.

One of the first things you learn when you start to decipher Unix is how to list the contents of a file on to your terminal. Now this sounds straightforward enough, but in Unix even this simple operation has its drawbacks.

Function	Unix command name
c compiler	cc
change working directory	chdir
change password	passwd
concatenate	cat
copy	cp
date	date
echo	echo
editor	ed
link	ln
move	mv
remove	rm
search file for pattern	grep

Table 1.

Suppose I have a file called Testfile. I want to see what is inside of it. How would you design a system to do it? I would have written a program that listed the contents on to the terminal, perhaps stopping every 24 lines if you had signified that you were on a display terminal with only a 24-line display. Unix, however, has no basic listing command, and instead uses a program meant to do something else.

Side-effects

Thus if you want to list the contents of a file called HappyDays, you use the command named Cat:

```
cat HappyDays
```

Why Cat? Why not? After all, as Humpty Dumpty said to Alice, who is to be the boss, words or us? Cat, short for "concatenate" as in, take file 1 and concatenate it with file 2 — yielding one file, with the first part file 1, the second file 2 and put the result on the "standard output", which is usually the terminal:

```
cat file 1 file 2
```

If you have only one file, Cat will put it on the standard output — the terminal. That accomplishes the goal, except for those of us with video terminals, who watch helplessly as the text goes streaming off the display.

The Unix designers believe in the principle that special-purpose functions can be avoided by clever use of a small set of system primitives. Why make a special function when the side-effects of other functions will do what you want? Well, for several reasons:

- Meaningful terms are considerably easier to learn than non-meaningful ones. In computer systems, this means that names should reflect function, otherwise the names for the function will be difficult to recall.
- Making use of the side-effects of system primitives can be risky. If cat is used unwisely, it will destroy files.
- Special functions can do useful things for users, such as stop at the end of screens, or put on page headings, or transform non-printing characters into printing ones, or get

rid of underlines for terminals that cannot perform them.

Cat, of course, will not stop at terminal or page boundaries, because doing so would disrupt the concatenation feature. But still, it is elegant to use Cat for listing. Who needs a print or a list command?

Notice the lack of consistency in forming the command name from the function table 1. Some names are formed by using the first two consonants of the function name. Editor, however, is Ed, concatenate is Cat, and Date and Echo are not abbreviated at all. Note how useful those two-letter abbreviations are. They save almost 400ms. per command.

Similar problems exist with the names of the file directories. Unix is a file-orientated system, with hierarchical directory structures, so the directory names are very important. This paper was written on a file named Unix and whose path is /cs1/norman/papers/CogEngineering/unix. The name of the top directory is "/", and cs1, norman, papers, and CogEngineering are the names of directories hierarchically placed beneath "/".

Note that the symbol "/" has two meanings: the name of the top-level directory and the symbol that separates levels of the directories. This is very difficult to justify to new users. And those names: the directory for Users and Mount are called, of course, Usr and Mnt. And there are Bin, Lib, and Tmp binary, library, and temp. Unix loves abbreviations, even when the original name is already very short. To write "user" as Usr or "temp" as Tmp saves only one letter. But Unix is inconsistent; it keeps Grep at its full four letters, when it could have been abbreviated as Gr or Gp.

Another important routine goes by the name of Dsw. Suppose you accidentally create a file whose name has a non-printing character in it. How can you remove it? The command that lists the files on your directory will not show non-printing characters. Also, if the character is a space — or worse, a "*" — the program that removes files will not accept it. The name Dsw was evidently written by someone at Bell Labs who felt frustrated by this problem and hacked up a quick solution. Dsw goes to each file in your directory and asks you to respond "Yes" or "No," whether to delete the file or keep it.

Yes means no

How do you remember Dsw? What on earth does the name stand for? The Unix people will not tell; the manual smiles the wry smile of the professional programmer and says: "The name Dsw is a carry-over from the ancient past. Its etymology is amusing".

If you say "Yes", the file is deleted, of course. So if you go through your files and see important-file, you nod to yourself and say: "Yes, I had better keep that one". You type in "Yes," and destroy it forever. There is no warning; Dsw doesn't even document itself when it starts, to remind you of which way is which. Berkeley Unix has finally killed Dsw, saying "This little-known, but indispensable facility has been taken over . . ." That is a fitting commentary on standard Unix: a system that allows an "indispensable facility" to be "little known."

Beware the glob

The symbol "*" means "glob" — a typical Unix name. Let me illustrate with our friend, Cat. Suppose I want to collect a set of files named paper.1 paper.2 paper.3 and paper.4 into one file. I can do this with cat:

```
cat paper.1 paper.2 paper.3
paper.4 > newfilename
```

Unix provides "glob" to make the job even easier. Glob means to expand the file name by examining all files in the directory to find all that fit. Thus, I can redo my command as

```
cat paper* > newfilename
```

where paper* expands to

```
paper.1 paper.2 paper.3 paper.4
```

This is one of the typical virtues of Unix; there are a number of quite helpful functions. But suppose I had decided to name this new file "paper.all".

```
cat paper* > paper.all
```

In this case, paper* expands to paper.1 paper.2 paper.3 paper.4 paper.all, and so I am filling up a file from itself:

```
cat paper.1 paper.2 paper.3 paper.4
paper.all > paper.all
```

Eventually the file will burst.

Does Unix check against this, or at least give a warning? No such luck. The manual does not alert users to this either, although it does warn of another, related infelicity: "Beware of 'cat a b > a' and 'cat b a > a', which destroy the input files before reading them".

The command to remove all files that start with the word "paper"

```
rm paper*
```

becomes a disaster if a space is inserted by accident:

```
rm paper *
```

for now the file "paper" is removed, as well as every file in the entire directory — the power of glob.

Why is there not a check against such things? I finally had to alter my version of Rm so that when I said to remove files, they were moved to a special directory named "deleted" and preserved there until I logged off, leaving me lots of time for second thoughts and catching errors. This illustrates the power of Unix: what other operating system would make it so easy for someone to completely change the operation of a system command? It also illustrates the trouble with Unix: what other operating system would make it so necessary to do so?

The standard text editor is called Ed. I spent a year using it as an experimental vehicle to see how people deal with such confusing things. Ed's major property is

(continued on next page)

SHOPWINDOW

TRS 80 16K LII and VIDEO GENI FUNCTIONAL BUSINESS PROGRAMMES FOR CASSETTE

British Software Is Best. Don't throw your money away on cheap software when you can obtain ours which is LOWER in PRICE and FUNCTIONAL.

TYPER 1V Mini Wordprocessor £15.00
The amazing wordprocessor for business and personal use. Will satisfy your needs until you require a disk based wordprocessor. A few of its features are: Word Wrap, Automatic Paragraphs, Right & Left Justified print. Screen Display, Edlting and inserting during typing. Choice of three print sizes. Permanently stores name and addresses for automatic insertion. Auto Date & Letter Heading. Manual Included. Runs on Oki. Easily adaptable for other printers.

MAILING LIST £9.95
Full facilities for searching, amending.

BANK ACCOUNT £21.95
Stores 32 Analised self totalling headings and all bank movements including Brought forward balances. All Data Stored on tape.

SALES LEDGER £21.95
Full Record up to 17 headings for each invoice.

GAMES — ALL EXCLUSIVE from £5.00, eg SAUCER ATTACK £5.00.

PRINTERS!!!! EPSOM MX-80 F/T £374.00. MX-80 £336.00. OKI.80 £275.00. **SUPERBRAINS** 64K 320K £1,865.00. **RIBBONS** MX-80 £8.75. **REFILLS** £5.25.

PAPER 9.5x11, White stripable 2,000 Sheets £14.00 + £2.55 p&p.

ALL PRICES PLUS POSTAGE + VAT.
SAE for Brochure

ACCESS COMPUTERS
2 Rose Yard, Maldstone, Kent ME14 1HN
Tel: (0622) 58356

● Circle No. 218

Computer Junk Shop

We Buy, Sell, Break Computers and Peripherals

Surplus Stock

New and Used Power Supplies To Most Specifications Always Available

10, Waterloo Road, Widnes, Halton, Cheshire. WA8 0PY
Telephone : 051 420 4590

● Circle No. 219

TRS80 HARDWARE (MODEL 1)

A/D CONVERTER
Model 1 has 4 Inputs, also 2 Flag Inputs and Analogue out. 240v. P.S.U. Cable connector to keyboard. Software included. Board only: £48.00. Complete in case: £60.00. P&P £1.50.
Model 2 has 18 ANALOGUE INPUTS otherwise as above. Complete in case. Price: £00.00. P&P £2.00.

JOYSTICK CONTROLLED
Uses Atari Joystick, complete with edge connector to keyboard. Software included.
£24.00. P&P £1.00.

I/O PORT
Provides 6 solid state outputs at 12v.d.c. 25m/a and 2 Relay contact outputs rated at 240v.A.C. 4 Amp. 8 T.T.L. Inputs. LED indication of outputs. P.S.U. and Connector to Keyboard. Software included. £72.00 P&P. £2.00

LIGHT PEN
Plugs into Cassette socket. BUILT IN AMPLIFIER. Negligible battery consumption. Software included. £22.00. P&P £1.00.

All prices include VAT.

T. GARLAND & SON LTD.
14A Kenworthy Lane,
Northenden, Manchester M22 4EJ.
Phone: 061-998 4207.

● Circle No. 220

SHOPWINDOW

RADEC

Professional Products for Practical People

ASCII Keyboards

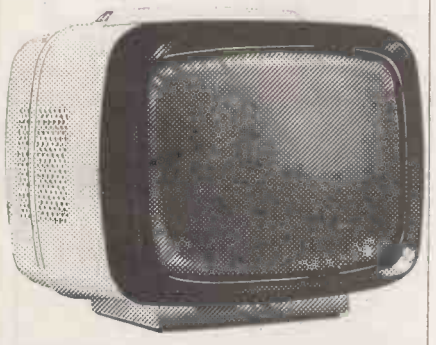
- Upper & Lower Case plus Control
- Low Power Consumption
- Shift & Alpha Lock
- Autorepeat (Model 777)
- Parallel Data Output
- Metal Mounting Frame
- Suitable for Tuscan, Tangerine etc.

Model KB756A	56 key	£39.50
KB710	Numeric Pad	£ 7.50
KB771	72 key	£55.00
KB777	77 key	£62.50

Accessories available include:-

Metal Case	£12.95
Edge Connector	£ 1.95
DC to DC Convertor (for operation off single 5V supply)	£ 5.00

High Resolution Computer Monitor



- 12" Green P31 Phosphor
- 80 Character Line Capability
- 22 MHz Video Bandwidth
- 240V AC Input
- Toroidal Transformer
- Composite Video Input
- Ideal for Apple, Gemini, Nascom, Tuscan etc.

MODEL 101 £129.50

U.K. Orders add 15% VAT on order total
Orders under £15 add £1.50 p&p. plus VAT
Overseas orders add £2.50 p&p
FULL DATA SHEETS ON REQUEST

Citadel Products Ltd
Dept. P.C. 50 High Street Edgware
Middlesex HA8 7EP Tel:01-951 1848

● Circle No. 221

(continued from previous page)

shyness; he does not like to talk.

You invoke Ed by saying, reasonably enough, "Ed." The result is silence: no response, no prompt, no message, just silence. Novices are never sure what that silence means. Ed would be a little more likeable if he answered, "thank you, here I am," or at least produced a prompt character, but in Unix silence is golden. No response means that everything is alright. If something had gone wrong, it would have told you.

Then there is the famous append mode error. To add text into the buffer, you have to enter "append mode." To do this, you simply type "a," followed by Return. Now everything that is typed on the terminal goes into the buffer. Ed, true to form, does not inform you that it is now in append mode: when you type "a" followed by Return the result is silence. When you have finished adding text, you are supposed to type a line that "contains only a . on it" to get you out of append mode. Ed does not tell you when have left append mode. This problem is so obvious that even the designers recognised it, but their reaction, in the tutorial introduction to Ed, is merely to note wryly that even experienced programmers make this mistake. While they may be able to see humour in the problem, it is devastating to the inexperienced secretary, research assistant or student trying to use Unix as a word processor, an experienced tool, or just to help them learn about computers.

Suppose you have been working on a file for an hour and then decide to finish work, exiting Ed by saying "q." The problem is that Ed would promptly quit, destroying your last hour's work. Thank goodness for all those people across the country who immediately rewrote the text editor so that we normal people — who make errors — have some other choices besides Ed, editors that tell you politely when they are working, that tell you if they are in append or command mode, and that do not let you finish without saving your file unless you are first warned, and then only if you say you really mean it.

Users' pet hates

As I wrote this paper I asked my colleagues to tell me of their favorite grouses. I got a lot of responses, all with much the same flavour, mostly commenting about the lack of consistency and the lack of interactive feedback. Thus, there is no standardisation of means to exit programs and because the "shell" is just another program as far as the system is concerned, it is very easy to log yourself off the system by accident.

There are very useful pattern matching features — such as the "*" function — but the shell and the different programs use the symbols in inconsistent ways. The Unix copy command — Cp — and the related C programming language "string-

BELL LABS' VIEW

WHILE PRAISING the Unix system design, Donald Norman makes a number of caustic remarks about command names and other aspects of the human interface. These might be ignored, since he has no experimental tests to justify them; or they might even be taken as flattery of Unix, since he does not name any system he likes better; but some of his comments are worth discussing.

Most of the command names Norman points to are indeed strange; some such as

by Michael Lesk of Bell Laboratories

Dsw, were removed several years ago — by the way, to repair the discourtesy of the manual, Dsw meant "delete from switches". However, it is not clear that it makes much difference what the command names are. T K Landauer, K Galotti and S Hartwell recently tried teaching people a version of the editor in which append, "delete," and "substitute" were called "allege," "cypher," and "deliberate." It did not seem to have much effect on learning time, and afterwards the users would say things like "I alleged three lines and deliberated a comma on the last one" just like subjects who had learned the ordinary version of the editor."

In addition to the amusing but secondary discussions of command names, Norman does raise some significant issues:

- whether systems should be verbose or terse;
- whether they should have a few general commands or many special-purpose ones;
- whether they should try to anticipate typical mistakes.

Unix is undoubtedly near an extreme of terseness, partly because it was originally designed for slow hard copy terminals. However, the terseness is very valuable when connecting processes. If the command that lists the logged-on users prints a heading above the list, you cannot tell how many users are on by feeding the command output to a line counter. If the editor types acknowledgements now and then, its output may not be directly usable as input somewhere else.

Norman complains about using Cat for a command which prints files, rather than having a special-purpose command for the purpose — there is one, by the way; it is Pg. Having a few general-purpose commands is a definite aid to system learning. In practice, it is not the novices who use

copy" — strcpy — reverse the meaning of their arguments, and Unix move — Mv — and copy — Cp — operations destroy existing files without any warning. Many programs take special "argument flags" but the manner of specifying the flags is inconsistent, varying from program to program.

The version of Unix I now use is called the Fourth Berkeley Edition for the Vax, distributed by Joy, Babaoglu, Fabry, and Sklower at the University of California, Berkeley — henceforth, Berkeley Unix.

Among the advantages are: history lists, aliases, a richer and more intelligent set of system programs — including a list program, an intelligent screen editor, an intelligent set of routines for interacting with terminals according to their capabilities. It includes a job control that allows you to stop jobs in the middle, start up new ones, move things from background to foreground and vice versa, examine files, and then resume jobs. The shell has been amplified to be a more powerful programming language, complete with file-handling capabilities, If Then Else statements, While, Case and other goodies of structured programming.

Aliases are worthy of special comment. They let users tailor the system to their own needs, naming things in ways they can remember. Names you devise yourself are easier to recall than names provided to you. Aliases also allow abbreviations that are comprehensible to the individual, without burdening everyone else with your cleverness or difficulties.

To work on this paper, I need only type the word "unix," for I have set up an alias called Unix that is defined to be equal to the correct command to change directories, combined with a call to the editor — called Vi for "visual" on this system — on the file:

```
alias unix "chdir /cs1/norman/papers/
    CogEngineering; vi unix"
```

These Berkeley Unix features have proved to be indispensable: the people in my laboratory would probably refuse to go back to standard Unix.

Outside system

The bad news is that Berkeley Unix is jury-rigged on top of regular Unix, so it can only patch up the faults: it does not remedy them. Grep is not only still Grep, but there is an Egrep and an Fgrep.

The generators of Berkeley Unix have their problems: if Bell Labs people are smug and lean, Berkeley people are cute and overweight. Programs are wordy and special features proliferate. The system is so large that it no longer fits on the smaller machines: our laboratory machine, a DEC-11/45, cannot hold the latest release of Berkeley Unix even with a full complement of memory and a reasonable amount of disc. I wrote this paper on a Vax.

(continued on next page)

the alternatives to Cat; it is the experts, who want something better-adapted to their special needs and are willing to learn another command.

In general, people are quite good at recognising special uses of commands in context, probably because it is a lot like things they have to do every day in English. To take an analogy from programming languages, one doubts that Norman would advocate a separate operator for "+" in integer arithmetic and "+" in floating-point arithmetic. There are many advantages to a small, general-purpose set of commands. Having only one way to do any given task minimises software maintenance while maximising the ability of two users to help each other with advice. But this implies that whenever a general command and a specific command do the same thing, the specific command should be removed.

Choices to be made

It would be a definite service if the cognitive engineers could tell us how many commands are reasonable, to give some guidance on, for example, whether "merge" should be a separate command or an option on "sort" — on Unix it is a sort option — and whether the terminal drivers should be separate commands or options on a graphics output command — on Unix they are separate. The best rule of thumb we have today is that designing the system so that the manual will be as short as possible minimises learning effort.

Norman seems to think that the computer should try to anticipate user problems, and refuse commands that appear dangerous. The computer world is undoubtedly moving in this direction; strong typing in programming languages is a good example. The Ed editor has for some years provided a warning if the user tries to quit without writing a file. The Vi editor has an Undo feature, regardless of the complexity of the command which has been executed. Such a facility is undoubtedly the best solution.

A large number of Norman's comments are pleas for consistency. Unix has grown more than it has been built, with many people from many places tossing software into the system. The ability of the system to accept commands so easily is one of its main strengths.

The thought of a Unix Command Standardisation Committee trying to impose rules on names is a frightening alternative. Much of the attractiveness of Unix derives from its hospitality to new commands and features. This has also meant a diversity of names and styles. To some of us this diversity is attractive, while to others it is frustrating, but to hope for the hospitality without the diversity is unrealistic.

SHOPWINDOW

ZX-81

CASSETTE ONE

"I had your Invaders/React cassette . . . I was delighted with this first cassette"
— P. Rubython, London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month. Please let . . . into the secret of your first time load every time!"
— E. H., London SW4

CASSETTE ONE SIDE ONE 1K MACHINE CODE PROGRAMS
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bug splat, Bouncing letters

CASSETTE ONE SIDE ONE 1K BASIC PROGRAMS
I Ching, Mastermind, Basic hangman, Robots

CASSETTE ONE SIDE TWO
has large screen versions of Invaders and Maze of Death, ready for when you get 16K. All on Cassette One for £3.80.

CASSETTE TWO
— just out, ten 16K Basic games.

OTHELLO
AWARI
LASER BASES
WORD MASTERMIND
RECTANGLES
CRASH
ROULETTE
PONTOON
PENNY SHOOT
GUN COMMAND

All on Cassette Two for £5

Recorded on quality cassettes, sent by first class post. From:
Michael Orwin, 26 Brownlow Road, Willesden, London NW10 9QL

● Circle No. 222

Call COMPUTALINE on (01) 840 1177/3444

For Printers eg Oki matrix from £245
Daisywheel from £730
For Computers eg Superbrain* from £1910
Apple* £Call

For Value, whether you need hardware, software or full systems, call

COMPUTALINE

St James' House, 105-113 The Broadway, Ealing, London W13 9BL

● Circle No. 223

ATOM USERS!

ADPROM 4000 UNIT
for adding on EPROMS as required. Can be used on other computers with 24 pin EPROM sockets (e.g. ZX 80). . . . . £32 (excl. vat & p.p.)

WANTED!! Elegant programs for our EPROM and TAPE library service. Details on request with brochure.

* * *

ATOM CONSOLE CASE

Case only . . . . £25 (excl. vat & p.p.)
Polished teak veneered sides, textured black stelvetite and aluminium chassis. Plenty of room inside for RAM Expansion (units available from us), power supplies etc., and T.V. on top. Available as case only, or with integral RAM expansion unit, and/or integral ADPROM 4000.

* * *

CASES FOR YOUR OWN PROJECTS
Low priced QUALITY cases - STRONG enough for the workshop - ATTRACTIVE enough for the home.

Matt black plastic end cheeks, textured Stelvetite body. . from £6·25
Teak veneered end cheeks, Aluminium & Stelvetite body. . from £7·88
(excl. vat & p.p.)

* * *

FOR BROCHURE & PRICE LIST SEND AS SAE TO
ELINCA LTD., LYON WORKS, CAPEL ST., SHEFFIELD S6 2HL

● Circle No. 224

SHOPWINDOW

RAM BARGAINS

4116-200ns.	80p each
100+	68p each
2114-200ns.	85p each
100+	75p each
2114-450ns.	75p each
100+	65p each

Other IC's available.
Plus 50p P&P + VAT at 15%.

EPROM 2716-5V-450ns.	£2.20 each
2532-450ns.	£4.20 each

Other IC's available.

ATHANA FLOPPIES

Minis with free plastic library case

S/S-S/D	£19.95 for 10
D/S-D/D	£25.50 for 10
S/S-Quad D	£28.50 for 10

All with hub rings. 8" discs.

S/S-D/D	£26.50 for 10
D/S-D/D	£27.50 for 10

Other discs and special formats available.
Add 50p P&P to chip orders and 85p for discs + VAT at 15%.
COMPUTER DESKS from £49.90. Send for illustration.

OPUS SUPPLIES
10 BECKENHAM GROVE, SHORTLANDS, KENT.
RING: 01-464 5040 or 01-467 9309 for further details and quantity discounts.

● Circle No. 225

TRS 80 MODEL III

GRAPHICS & ANIMATION - 48K Disc

Obtain the full potential of your machines graphics capability with this disc based m/c code programme. Only £12

Send SAE for overview to
R Hopkinson
Iliffe House, Oadby Ind Estate, Leicester

● Circle No. 226

AT LAST!

ALL PRICES INCLUSIVE
TELEPHONE: 051-227 2642

VIC SOFTWARE

VICMEN
A full-feature version of the popular "Puckman" arcade game for the UNEXPANDED VIC. Written entirely in machine-code for fast action.
SUPPLIED ON CASSETTE at £7

VICGAMMON
Standard Backgammon game for the VIC with 3K expansion. Rapid computer responses. Instructions on how to play are included.
SUPPLIED ON CASSETTE at £7

More VIC software will be available by the time you read this. Phone 051-227 2642 for details. Generous DEALER DISCOUNTS available — phone Dave on 051-227 2299 for details.

BUG-BYTE
98-100 THE ALBANY, OLD HALL STREET, LIVERPOOL L3 9EP

● Circle No. 227

(continued from previous page)

Learning the system for setting up aliases is not easy for beginners, who may be the people who need them most. You have to set them up in a file called .Cshrc, not a name that inspires confidence. The full stop in the file name means that it is invisible — the normal method of directory listing program will not show it.

The directory listing program, ls, comes with 19 possible argument flags, which can be used singly or in combinations. The number of special files that must be set up to use all the facilities is horrendous, and they get more complex with each new release from Berkeley.

Too much bitching

It is very difficult for new users. The program names are whimsical rather than systematic. Whimsicality is probably better than standard Unix's lack of meaning, but there are limits. The listing program is called More — as in, "give me more". The program that tells you who is on the system is called Finger, and a keyword help file — most helpful, by the way — is called Apropos. I used the alias feature to rename it Help.

One reader of a draft of this paper — a systems programmer — complained bitterly: "Such whining, hand-wringing, and general bitchiness will cause most people to dismiss it as over-emotional nonsense .... The Unix system was originally designed by systems programmers for their own use and with no intention for others using it. Other hackers liked it so much that eventually a lot of them started using it. Word spread about this wonderful system, and the rest you probably know. I think that Ken Thompson and Dennis Ritchie could easily shrug their shoulders and say 'But we never intended it for other than our personal use' ".

This was the only complaint, and I sympathise with its spirit. It should be remembered, though, that Unix is nationally distributed in the U.S. under strict licensing agreements. Western Electric's motives are not altogether altruistic. If Unix had remained a simple experiment on the development of operating systems, then complaints could be made in a more friendly, constructive manner. But Unix is more than that. It is taken as the very model of a proper operating system, and that is exactly what it is not.

In the development of the system aspects of Unix, the designers have done a magnificent job. They have been creative, and systematic. A common theme runs through the development of programs, and by means of their file structure, the development of "pipes" and "redirection" of both input and output, plus the power of the iterative "shell" system-level commands, you can easily combine system-level programs into self-tailored systems of remarkable power. For system programmers, Unix is a delight. It is well structured, with a consistent, powerful philosophy of control and structure.

Why was the same effort not put into the design at the level of the user? The answer is complex, but one reason is the fact that there really are no well-known principles of design at the level of the user interface.

The three most important concepts for system design are:

- Be consistent. A fundamental set of principles ought to be evolved and followed consistently throughout all phases of the design.
- Provide the user with an explicit model. Users develop mental models of the devices with which they interact. If you do not provide them with one, they will make one up themselves, and the one they create is likely to be wrong.

Do not count on the user fully understanding the mechanics of the device. Both secretaries and scientists may be ignorant of the difference between the buffer, the working memory, the working files, and the permanent files of a text editor. They are likely to believe that once they have typed something into the system, it is permanently in their files. They are likely to expect more intelligence from the system than the designer knows is there. And they are likely to read into comments — or the lack of comments — more than you have intended.

Feedback is of critical importance in helping establish the appropriate mental model and in letting the user keep its current state in synchrony with the actual system.

- Provide mnemonic aids. For most purposes it is convenient to think of human memory as consisting of two parts: a short-term memory and a long-term memory — modern cognitive psychology is developing more sophisticated notions, but this is still a valid approximation. Five to seven items is about the limit for short-term memory, so do not expect a user to remember the contents of a message for much longer than it is visible on the terminal. Long-term memory is robust, but it faces two difficulties: getting stuff in so that it is properly organised, and getting stuff out when it is needed. Learning is difficult, unless there is a good structure and it is visible to the learner.

There are lots of sensible memory aids that can be provided, but the most powerful and sensible of all is understanding. Make the command names describe the function that is desired. If abbreviations must be used, adopt a consistent policy of forming them. Do not deviate from the policy, even when it appears that a particular command warrants doing so.

System designers take note. Design the system for the person, not for the computer, not even for yourself. People are also information-processing systems, with varying degrees of knowledge and experience. Friendly systems treat users as normal, intelligent adults who are sometimes forgetful and are rarely as knowledgeable about the world as they would like to be. There is no need to talk down to the user, nor to explain everything. But give the users a share in understanding by presenting a consistent view of the system. Their response will be your reward.

Reprinted with permission of Datamation®. ©Copyright by Technical Publishing Company, 1982. All rights reserved.

BUYERS' GUIDE

Printers

The Peripherals Buyers' Guide is a survey of printers suitable for small computers. We have excluded any system which costs significantly more than £2,000. The printers are listed in alphabetical order. The addresses of the main suppliers are listed at the end of the guide.

Printers may be divided into several categories. The highest-quality printing is produced by the daisywheel-type which creates text in various type-faces, according to the wheel used. The quality ranges from excellent typing to rather poor book printing and generally there is a proportional-spacing facility. Those machines tend to be expensive and slow. Daisywheels can be either plastic — inexpensive, but must be replaced often — or metal — expensive but durable.

For faster printing, you must turn to dot-matrix machines. The print quality tends to be poor and the machines noisy. Older machines use a 7-by-5 matrix which puts the descenders of letters such as 'y' above the line. That makes bulk text difficult to read. Better printers use a matrix nine dots deep to give true descenders. Recently, several firms have produced dot-matrix printers which give an approximation to typewriter printing and proportional spacing. They are less expensive than daisywheel machines, work faster and could well be used for correspondence-quality work.

Some dot-matrix printers employ sensitised paper to produce printing by more direct electrical effects. They are often quiet and fast, but the paper can be expensive, unpleasant to handle and hard to obtain.

The trend is to build more processing power into printers. That means they offer increasingly varied features, so it is hard to categorise them precisely.

A printer has to be connected to the computer by a cable and a more or less standard interface. The normal interfaces are the Centronics parallel, RS232 serial port — also known as the V-24 — and 20mA current loop. IEEE is a parallel interface used by Pet; 'cpl' means characters per line, 'cps' means printing speed in characters per second. Allow five characters to the word.

The more intelligent printer prints as its head moves in both directions across the paper — bi-directional printing. Still more intelligent ones end the head movement at the ends of short lines. These two features can more then treble the working speed.

Printers use two types of paper: plain paper fed — like a

SHOPWINDOW

TRS-80 Compiler Work-Station

Model I and III, and Video Genie

Speed up your Basic Program Development

EDIT — Full-screen BASIC editor with floating cursor and auto repeat. 30 commands and functions let you find, change, insert, delete, replicate, copy, or move BASIC text at the character, string, line, or block level. Improved program visibility, fewer errors. £17.50

EXEC — Command-list processor. Speeds up and simplifies repetitive procedures such as power-up, file reorganisation. £9.50

Speed up your Basic Program Execution

ACCEL2 — Compiler for Model I and III BASIC (disk and non-disk). Execution speed-ups of 20-30 times for integer operations, 5-7 times for string handling, less if I/O limited. Very easy to use. Professionals note: Full instructions for selling derived code on tape or disk. No royalties! Ask for more details. £39.95

TSAVE—Writes compiled code to SYSTEM tape. Makes core-image backups of any machine-language programs. £4.95

southern software

PO Box 39, Eastleigh, Hants, England, SO5 5WQ

● Circle No. 228

apple

in CROYDON

APPLE II HARDWARE
APPLE II SOFTWARE
APPLE II PERIPHERALS
APPLE II BESPOKE SOFTWARE

5¼" Winchester with software now available . . . POA.

OPEN 9AM to 8PM 6 DAYS A WEEK, SUNDAY
DEMONSTRATIONS BY APPOINTMENT
IF WE DON'T HAVE IT WE WILL GET IT!
CALL OR PHONE FOR PRICES & DETAILS

SYMBIOTIC COMPUTER SYSTEMS
85/87 STATION RD, WEST CROYDON
TEL: 01-680 8606

● Circle No. 229

LCL O-LEVEL MATHS

40 co-ordinated programs now available for the Apple, ZX81 and RML 380Z. Programs for class demonstration, using High-Res. colour graphics, or for self-tuition. For example, POPULAR 110 costs £4.40 and is on: Factorisation (of 2 types of equation). Statistics. Simple and Compound Interest. Problems using sin, cos and tan rules.

Phone (8-3) or write for free catalogue to:
G. Ludinski B.Sc(Hons) AMBCS. (0784) 58771.
LCL, 26 Avondale Avenue, Staines, Middx.

● Circle No. 230

Brilliantly simple

On our launch we are pleased to offer you

£1350 OF FREE MICROCOMPUTER

software and services which includes: Incomplete Record/ Book-keeping/Financial Accounting and Payroll, General Data Management, Invoicing, Letter Writing or Word Processing systems and one day training with first 50 ADLER-ALPHATRONIC MICROCOMPUTERS sold at £2,345 each, leasing from £15.60 a week excluding VAT.

Please telephone for a demonstration to **Watford 48580.**

OVERSEAS COMPUTER SYSTEMS CONSULTANTS

182a, Queens Road, Watford.

● Circle No. 231

JOB OPPORTUNITY

JOB OPPORTUNITY

Successful Microcomputer company in south east London is looking for an experienced sales person to assist manager in new retail outlet. Apple and Commodore experience a must. Ground floor opportunity. Excellent potential, very high earnings basic plus commission.

RING TIM WALSH 699 2202.

● Circle No. 232

SHARP

COMPLETE BUSINESS SYSTEM
ONLY **£1,700** + VAT

Includes

* MZ-80K 48K COMPUTER
* DUAL DISC DRIVE * PRINTER
* EXPANSION BOX * COVERS
* PAPER * DISCS * MANUALS
* SALES LEDGER * PURCHASE LEDGER
* NOMINAL LEDGER * STOCK CONTROL

Everyman Computers

14, EDWARD STREET, WESTBURY, WILTS. TEL: 0373 864644

● Circle No. 233

typewriter — pinch- and pin- or sprocket- or tractor-fed with holes along the margins. That paper can be supplied fan-folded or in rolls.

Pinch feeding is more expensive but is convenient for letters. Only a few machines will accept both pinch- and pin-fed paper. It is possible to obtain headed letter paper bonded lightly on to pin-fed, fan-folded computer paper for word processors.

Some printers allow direct control of the print-head to give graphics. KSR means keyboard, send and receive, ASR means automatic send and receive, RO means receive only. KSR machines can be used as electric typewriters in local mode.

Comb or line printers have a whole line's worth of dot hammers so they can print a line of text at a time. They tend to be very expensive and very noisy but produce an enormous quantity of work.

ACCESS DATA COMMUNICATIONS

ADC 1251 *£560*
Matrix printer, continuous paper, £13 per box, 80 or 132 cpl, 125 cps, 7x9 matrix. RS232, Centronics and IEEE interfaces.

ADC 2401 *£1,350*
9x9 dot-matrix printer, continuous paper, 136 cpl, 240 cps, RS232, Centronics and IEEE interfaces. Available from Access Data Communications.

ADDMASTER

400 receive only *£242*
Uses 2.5in. Tally roll paper, 16 cpl, 48 cps. Main U.K. agent Clary Ltd.

420/426 receive only *£246*
Dot matrix grade-one Tally roll paper at £5 for 20 rolls. BCD serial or 10-line serial interfaces, 12 cpl, 36 cps.

ANADEX

Main U.K. agent Anadex Ltd

DP-500 *from £367*
Dot matrix, tractor feed, parallel interfaces, 18 cpl, 45 cps.

DP-660 *from £700*
Dot matrix, pinch feed for printing labels, uses sprocket feed. Parallel interface. 19 cpl, 57 cps.

DP-750A *from £800*
Dot matrix, RS232C 20mA current loop, 21 cps, 25 cps.

FP-600 *from £65*
Dot matrix ticket or form printer, from four columns to 19 columns parallel interface, 19 cpl, 44 cps.

DP-9500 Series *£895 upwards*
Dot matrix, tractor feed, nine-wire print head, bi-directional printing, three ASCII interfaces as standard — parallel bit, RS232C, current loop — 120-200 cps, 132-220 columns, 7x9, 9x9 or 11x9 matrices depending on model. Also from: Peripheral Hardware, Kode Services, Robox, Stack Computer Services and Data Design Techniques Ltd.

DP-8000 *£550*
Dot matrix, pinch feed, bi-directional printing, fan-fold paper up to 9.5 in. up to three copies. Three ASCII interfaces — parallel bit, RS232C, current loop — 112 cps, 80 column, 9x7 matrix. Also from: Peripheral Hardware, Kode Services, Robox, Stack Computer Services and Data Design Techniques Ltd.

DP-1000 Series *from £395*
Dot matrix, tractor feed, internal data storage, roll-type paper for 40 columns at £11 for box of 10 rolls, three basic ASCII-compatible interfaces are available. 40 cpl, 50 cps, 40 columns, 5x7 matrix. Also from: Peripheral Hardware, Kode Services, Robox, Stack Computer Services.

AXION CORPORATION

Main U.K. agent Memec Systems Ltd

EX-820 receive only — *£500*
Electro-sensitive dot matrix includes plotting capability for full graphics, paper at £3 for a 240ft. roll, RS232C or 20mA serial and ASCII parallel, 20/40/80 cpl and up to 160 cps, 5x8 matrix.

EX-850 Video Printer — *£500*
Electro-sensitive dot matrix, aluminised paper at £3 for a 240ft. roll. Needs only the video signal from user's. Normal resolution 13.5 seconds per screen, high resolution 27 seconds per screen.

EX801/802 receive only — *£279*
Electro-sensitive, dot matrix, aluminised paper at £3 for a 240ft. roll, RS232C, Centronics, Apple, Pet, and Tandy interfaces, 20/40/80 cpl, 160 cps, 5x8 matrix.

BASE 2

800-MST — *from £385*
Impact dot matrix, bi-directional, tractor feed up to 9.5in., RS232C, 20mA, IEEE-488, Centronics and parallel interfaces, up to 132 cpl and 60 cps, with 5x7 matrix. Main U.K. agents Microbyte and Maclin-Zand Elecronics Ltd.

CENTRONICS

Main U.K. agents Sintrom Distribution, ITT Electronic Services, Cable and Wireless, Dacoll Engineering.

Models 700, 701, 702 and 703 — *P.O.A.*
Impact dot matrix, uses fan-fold paper, parallel, serial RS232C interfaces 132 cpl, up to 180 cps, 5x7 or 7x7 matrices.

Model 791 — *P.O.A.*
Demand-document printer, impact, dot matrix, up to 12-part forms using bottom feed tractor, standard parallel interface, with serial RS232C interface option, 80 cpl, 60 cps, 5x7 matrix.

Model 730 — *£375*
Impact, dot matrix, uses roll paper up to 8.5 in. wide, fan-fold paper up to 9.5 in. wide and cut sheet up to three-ply paper and two carbons, parallel-standard interface with serial RS232 option, 80 cpl, 100 cpls, 7x7 matrix. Also from: Datac Ltd, Rair Ltd, Comma Computers and MIBF.

Model 737 — *£425*
Impact dot matrix, roll fan-fold or cut sheet paper, standard parallel interface, serial RS232C option, 80 cpl mono-spaced mode, 50 cps mono-spaced mode, 80 cps proportional mode, 7x8 matrix mono-spaced, 9x9 proportional. Also from: Datac Ltd.

Model PI Microprinter and Model SI Microprinter — *P.O.A.*
Non-impact dot matrix electro-sensitive uses aluminium-coated paper roll, parallel interface, serial RS232C interface, up to 80 cpl, and 150 lines per minute, up to 200 cps. Also from: Datac Ltd.

Model 780 — *P.O.A.*
Impact, dot Matrix, pinch-roll paper feed for roll paper, tractor-feed option for rear- and bottom-feed forms and fan-fold paper, parallel interface with serial RS232C option, 80 cpl, 60 cps, 5x7 matrix.

Model 779 — *P.O.A.*
Impact, dot matrix, pinch-roll paper feed for roll paper, with fan-fold, tractor feed option, standard parallel interface with RS232C serial option, 80-132 cpl, 60-110 cps, 5x7 matrix.

Model 704 — *P.O.A.*
Impact, dot matrix, uses fan-fold paper, RS232 serial interface, 132 cpl, 180 cps using 7x7, 9x7 and 9x9 matrices.

Model 761 read only or keyboard send/receive — *P.O.A.*
Impact, dot matrix, uses fan-fold paper, RS232C/CCITT V24 or DC current loop interfaces, 132 cpl, 60 cps, 7x7 matrix.

NASCOM/SHARP MZ80K

Pascal for Nascoms and Sharp MZ80K

Hisoft offer a very fast 12K Pascal compiler producing Z80 object code directly i.e. no P-code.

STATEMENTS: CASE .. OF, IF .. THEN .. ELSE, REPEAT .. UNTIL, WHILE .. DO, BEGIN .. END

TYPES: INTEGER, REAL (7 sig. figs.), CHAR, BOOLEAN, ARRAY, SET, COLOUR.

Many standard procedures and functions are supported including trigonometric functions and all procedures and functions may be used fully recursively. The object programs run very fast and require only the runtime routines (4K) to be present.

Price: Nascom Pascal	£35
Sharp MZ80K Pascal	£37

New Monitor for Nascoms

NASMON is a new 4K monitor incorporating a powerful 'front panel' display of memory, registers and flags, together with an extended screen editor. We supply a range of software to run under NASMON; BAS12K, a 12K BASIC interpreter with 11 digit floating point arithmetic, NASGEN, a very fast Z80 assembler, NASNEM, a 2½K disassembler and NASPAS, the 12K Pascal compiler described above.

Prices: NASMON	£30
NASGEN in EPROM	£25
NASGEN on tape	£15
BAS12K on tape	£25
NASNEM in EPROM	£15
NASNEM on tape	£10

Z80 Development Package for Gemini G805 Disk Owners

The package comprises an extended screen editor, a fast Z80 assembler and a debugger with a 'front panel' mode and a Z80 disassembler. All supplied on one 5¼ inch diskette with full documentation.

Price £50.

All prices are fully inclusive.
Full details may be obtained from:

HISOFT

60 Hallam Moor, Liden,
SWINDON, SN3 6LS.
Tel: Swindon 26616
(answering machine service).

● Circle No. 234

FORTH

The small computer language of the eighties!

xForth

Our superb Z80/8080 implementation of the FORTH-79 standard, with virtual memory, screen editor, and many other facilities. Fully integrated with CM/M2.2.

Special offer £30

We have many other Forth products at low prices, including a resident assembler, and Cassady's Meta system that lets you generate ROMable code and cross-compile for your own or other machines or even other operating systems.

Amethyst

Write and find out why this is the best word processing system available! Price, including the BDS C-compiler so you can personalise the system if you like, is £250 (inc. VAT). Without the BDS C-compiler £200 (inc. VAT).

THE WORD

The best spelling check programme at ANY price:Q See Byte review. £48.

Good software needn't be expensive. Add £3 p&p to all orders. Add £5 for disk formats other than North Star. *Send S.A.E. for more details on these and other products.*

A.I.M. Research, 20 Montague Road, Cambridge CB4 1BX. Tel: 0223 353985

● Circle No. 235

BUSINESS SYSTEMS IN NORTH AND MID WALES

Integrated business systems based around SUPERBRAIN and TELEVIDEO CP/M machines. Sophisticated data entry validation, automatic update of Ledgers, Invoicing, Statements, VAT Report, Debt Control, Stock Control, etc. FREE training. Call for details and latest bargain prices.

FREE stock control program with every purchase of the best relational database system available, dBASE II.

SUPERBRAIN, TELEVIDEO (64K CP/M), PRINTERS, WordStar, dBASE II, Software, Consultancy, Systems.

CPL Ltd, Liverpool House, Pwllheli, Gwynedd, LL53 5DE. Tel: Pwllheli (0758) 3035.

● Circle No. 236

'SIMPLY WRITE'

Super word processor at a silly price!

FOR PET

All you'd expect for ten times the price, PLUS re-define keyboard, graphics printing, tape or disk files, old or new ROMs, PET or ASCII printers, AND 40 or 80 column (same tape or disk). We didn't believe it either! £37 tape (can save to disk); £40 disk (sample files etc). Manual £1 refundable. Specify drive.

and now. . .
'SIMPLY FILE': information manager (DBMS) to match!

Robust, versatile, self-calculating, economic back-up. £65 disk only, with manual. Manual £1 refundable. Specify drive.

LIGHT PEN + SOFTWARE — plug in & go. £22
PROGRAMMER'S TOOLKIT — makes programming less like work! 3.0: £28. 4.0 (incl 80): £30.
ADVENTURE 1 & 2: authentic Scott Adams 24K classic games. Each £7 (both, £13)
NEW! ASTEROIDS-81 — fast action. £6
Add VAT to all prices please, but post/insurance included. Unconditional Instant Refund Guarantee on hardware, also software if not up to description. Write for more details, more items, newsletter.

SIMPLE SOFTWARE LTD.,
15 Havelock Road,
Brighton, Sussex BN1 6GL
(0273) 504879

Buy it with Access

● Circle No. 237

BIG EARS STOP GO! LEFT! RIGHT!

SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Recognition System, complete with microphone, software and full instructions.

BUILT TESTED & GUARANTEED ONLY **£49**

PLEASE STATE COMPUTER: UK101, SUPERBOARD, NASCOM2, ZX80/81, PET, TRS80, MZ80K, APPLE II

ZX80 ZX81

MUSIC SYNTHESISER + 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway, etc. etc. Works with or without 16K RAM.

Add keyboard to make a live performance polyphonic synthesiser! Full instructions/software included.

AMAZING VALUE AT ONLY **£19.50** (KIT) £25.00 (BUILT)

COLOUR MODULATOR — RGB In, PAL/UHF out — KIT £12 BUILT £18

UK101/NASCOM COLOUR GRAPHICS — Inc. Modulator. Still the best selling system! — KIT £45 BUILT £60

Please add VAT at 15% to all prices.
Barclay/Access orders accepted by telephone

WILLIAM STUART SYSTEMS Ltd
Dower House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD
Telephone: Brentwood (0277) 810244

● Circle No. 238

MICROCOMPUTER SERVICE ENGINEER

AGE RANGE 18 to 30

Work involves trouble shooting, service and repair of a wide range of desk-top Microcomputers and peripherals including Commodore PET, APPLE, RAIR Blackbox etc. Knowledge of Software, eg Operating Systems, BASIC Programming an advantage.
Company is Nationwide Microcomputer Retail Organisation with Head Office in Camberley where Service Department is located.
Salary commensurate with age and experience. Company car provided after satisfactory probationary period.
Apply in writing with full particulars of personal detail, qualifications and experience to:

RAY JOHNSON
JOHNSON MICROCOMPUTERS
JOHNSON HOUSE, 75/79 PARK STREET
CAMBERLEY, SURREY TELEPHONE: (0276) 20446

● Circle No. 239

COMPUTER DEVICES INC

Miniterm 1201, 1202, 1203 — *from £936*
Thermal mechanism, uses Thermal Type B paper at £2.40 per roll, RS232 or parallel — 1201 only — interfaces, 80 or 132 cpl, 10/30 cps, 7x5 matrix. Main U.K. agent Teleprinter Equipment Ltd.

DATAC

Main U.K. agent Datac Ltd

414 free-standing assembly receive only — *£130*
Electro-sensitive, matrix printer type 245L, electro-sensitive roll paper, 59mm. wide x 30m. long at 90p per roll for 20 off, six-bit parallel ASCII, character serial interfaces, 16, 20, 32 or 40 cpl, 32 to 80 character per serial, 7x5 matrix.

DMI-40P free-standing terminal, receive only — *£350*
Impact, matrix, uses pressure-sensitive roll paper, 10mm.-wide ordinary paper version, using ink ribbon. Cost of paper £1 per roll, seven-bit parallel ASCII, character serial, RS232C or graphics, 40 or 20 cpl, up to 80 cps, 7x5 matrix.

411C compact panel mounting, receive only — *£209*
Electro-sensitive matrix type 245L or R, uses electro-sensitive roll paper, 59mm. wide x 30m. long at 90p per roll, six-bit parallel, serial interfaces, 16, 20, 32 or 40 cpl, 32 to 80 cps, 7x5 matrix.

411 panel mounting, receive only — *£189*
Electro-sensitive matrix printer type 245L or R, uses electro-sensitive roll paper, 59mm. wide x 30m. long at 90p per roll. Interfaces include six-bit parallel ASCII, character serial, four-bit parallel BCD, character parallel EIA/RS232C, CCITT/V24 and 20mA current loop, under development 40 cpl, 32 to 80 cps, 7x5 matrix.

313 panel-mounting, receive only and — *£269*
312 free-standing, receive only
Impact matrix type PU-1100, Tally roll paper, 59mm. wide x 36m. long at 60p per roll, CCITT/V24 or EIA RS232C or 20mA current loop interfaces, up to 20 cpl and up to 36 cps, 7x5 matrix.

412/1 and 412/5 receive only — *£255*
Electro-sensitive dot matrix type 245L, uses electro-sensitive aluminium-coated paper, 59mm. x 30m. at 90p per roll, six-bit parallel, ASCII, character serial and four-bit parallel BCD, character parallel, RS232C/V24 interfaces, 20mA current loop under development, 16, 20, 32 or 40 cpl, 32-80 cps, 7x5 matrix.

522/1 and 522/4 receive only — *£499 (522/1) £535 (522/4)*
Impact matrix type, roll paper, 114mm. x 75m. up to three copies plus original, cost of paper £1.10 per roll. Parallel interface and RS232C, 20mA current loop and parallel buttered, asynchronous interfaces — (522/4). 40 cpl, 100 cps instantaneous rate, 33 cps average rate — including CR and LF. 7x5, 7x10.

DATA DYNAMICS

Main U.K. agent Data Dynamics Ltd

303 Printer — *£980*
Dot matrix, up to six-part stationery width from 3m to 15.375in., V24/RS232C, 20mA current loop, 132 cpl, 30 or 60 cps, 7x7 matrix.

ZIP ASR/K7 twin cassette — *£2,000*
Dot matrix format, uses standard Teletype roll paper, V24, RS232C, or 20mA current loop operating at half or full duplex, 80 cpl, 10 or 30 cps switch selected, 5x7 matrix.

ZIP 30 keyboard printer, RO, ASR, or KSR — *ASR £1,800 RO & KSR £950*
Dot matrix, standard roll paper, 20mA half or full duplex current loop or V24 RS232C, 80 cpl, 10 or 30 cps — switch selected, 5x7 matrix.

390 eight-level and 392 five-level — *ASR from £1,250 LSR from £900 RO from £800*
ASR, KSR and read-only versions. Impact printers, friction or sprocket feed, 8.5in. paper with roll diameter 5in. 74 or 86 cpl, 6.6 or 10 cps.

Models 32 and 33 page printers — *ASR from £1,100 KSR from £800 RO from £700*
Available in ASR, KSR and receive-only versions. Friction or sprocket feed, 20mA or 60mA parallel, up to 86 cpl, 6.6 or 10 cps.

DATA GENERAL CORPORATION

Dasher TP1 Printer models 6040 and 6041 — *From £1,598*
6040 standard keyboard and can be used as a typewriter. 6041 is a receive-only terminal printer without keyboard, 30 or 60 cps, switch selectable, EIA-RS232C interfaces, 5x7 dot matrix. Main U.K. agent Data General.

DATAPLUS

400 series receive-only Model 480 — *£475*
Impact dot matrix, uses standard Tally roll, up to 3.75in. side, from 80p per roll, RS232C, V24, 20mA current loop, but parallel IEEE, Pet and Apple interfaces, 30/40 cpl, 110 cps, 7x5 and 7x10 matrices. Main U.K. agent Dataplus Ltd.

DATASOUTH CORPORATION

DS-180 — *£1,360*
Impact, matrix printer, uses fan-fold paper, RS232C, current loop, and parallel interfaces, 132 cpl, 180 cps, 9x7 matrix. Main U.K. agent Datatrade Ltd.

DIABLO

HY type II receive only — *P.O.A.*
Impact daisywheel plastic or metal print wheel, parallel, interface, 132 10-pitch cpl or 158 12-pitch cpl, 40/45/55 cps. Main U.K. agent Diablo Systems Ltd.

630 receive only — *£1,725*
Daisywheel, metal/plastic printwheels, standard listing or single sheet paper, RS232C, V24 with optional bus interface, 132 cpl at 10 pitch, 158 cpl at 12, 198 cpl at 15, up to 40 cps with automatic bi-directional printing. Main U.K. agent Geveke Electronics.

DIGITAL EQUIPMENT

DecWriter LA34 KSR — *£824*
Dot matrix, uses roll or fan-fold paper, friction-feed, up to five copies, V24 or 20mA interfaces, adjustable up to 256 cpl, 30 cps, 7x9 matrix. Main U.K. agent Extel.

A120 — *from £1,645*
7x7 dot matrix, EIA or 20mA option, up to 217 cpl, 180 cps. Main U.K. agent Wilkes Computing.

SHOPWINDOW

THE POWER BANK
Plug your micro computer video unit and Printer into the POWER BANK and forget about a disabling break in the electricity supply. This unit will continue to run your system for up to one hour in the event of a mains failure . . . WITH NO INTERUPTION TO YOUR WORK!

Batteries included

Vital when running business systems. This unit will of course suppress MAINS SPIKES and SURGES.
SIGNWAVE OUTPUT
Retail price **£320** + VAT
Weight 13Kgms Size 43cms × 20cms × 9cms
POWER TESTING LTD
1 St Mary's Lane, Upminster
Tel: Upminster 26938

● Circle No. 240

SHUGART
MINI FLOPPY DISC DRIVES
** THE LOWEST PRICES ANYWHERE **
SA 400 5¼" £105
BRAND NEW — 3 MONTH LABOUR & PARTS WARRANTY.
Also available Tandon TM100 – 1 drives
ENCOTEL SYSTEMS LTD
530 PURLEY WAY, CROYDON, S7
01-686 9687

● Circle No. 241

ALL RISKS INSURANCE FOR YOUR COMPUTER
Including Transit
for
Minimum sum insured £2,000
Minimum premium £10 Excess £10
GO TO
GENERAL MARINE & LIFE
Insurance Brokers
36 New Street, The Barbican, Plymouth PLA 2NA
Tel: (0752) 27721

● Circle No. 242

APPLE II DISK DRIVES STOCK CLEARANCE SALE
Limited quantity of Apple II disk drives (without controller) available at £199 (£231.15 inc. U.K. carriage & VAT). For use with DOS3.2/3.3 and Pascal 6 month warranty. First come first served. Access & Visa cards accepted.
TIMEDATA LTD
57 Swallowdale, Basildon, Essex.
Tel: (0268) 411125

● Circle No. 243

TTY

LOCAL/REMOTE COMMUNICATION WITH ANY COMPUTER SUPPORTING ASCII (TELETYPE-LIKE) TERMINALS

now available on

BRITISH GENIUS
CALTEXT
LSI SYSTEM M-3
SUPERBRAIN

at £180 + VAT from

THE MICRO SOLUTION

Park Farm House,
Heythrop,
Chipping Norton,
Oxon OX7 5TW
Tel: (0608) 3256

● Circle No. 244

Programmers and Analyst programmers required.

Knowledge of BASIC essential, CPM desirable.

Work in London — good salary.

Contact Geoff Planer:

BEYTS LOGIC LIMITED

WINDMILL RD, SUNBURY, MIDDX.
Tel: (09327) 86262.

● Circle No. 245

BCPL

THE PORTABLE SYSTEM PROGRAMMING LANGUAGE

now available on

SUPERBRAIN

at £250 + VAT (ex-stock) from

THE MICRO SOLUTION

Park Farm House,
Heythrop,
Chipping Norton,
Oxon OX7 5TW
Tel: (0608) 3256

● Circle No. 246

LISTING PAPER

2000 Sheets per Box

11"× 9½" ruled or plain **£16.00**

11"× 14½" ruled only **£17.00**

FULLY INCLUSIVE OF CARRIAGE AND VAT
UK MAINLAND ONLY CASH WITH ORDER

SS Scholarly Supplies
Woodlands Park Avenue
Woodlands Park, Maidenhead, Berks
Tel: Littlewick Green (062882) 3104

● Circle No. 247

DIGITRONIX

Mini-Printer *£195*
32 column electro-sensitive, 110-4,800 baud, ASCII Serial inputs at RS232C, 20mA, 64 font at 64 cps. Main U.K. agent Digitronix.

DRG

Starwriter FP1500-25 *£923*
96-character daisywheel printer. Up to 136 cpl, 25 cps, RS232 interface, compatible with sheet feeders. Self-testing, programmable vertical format unit. Available from DRG Business Machines.

ELECTROGRAPHIC AV

EG-800 receive only *from £450*
Impact, matrix printer, uses any type of paper, parallel, RS232C, TRS-80, Apple interfaces, 80 cpl, 150 cps, 7x5 or 7x6 matrices. Main U.K. agent Electrographic AV Ltd.

500 series receive only *from £175 for mechanism only*
Impact, matrix printer, uses 3.5in. Tally roll paper and flat documents, serial or parallel interfaces, 40 cpl, 120 cps, 7x5 or 7x6 matrices. Main U.K. agent Electrographic AV Ltd.

EPSON

TX-80 *£395*
Impact, dot matrix, friction pin-feed RS232C, V24, 20mA current loop, bit parallel, Centronics, IEEE, Pet, Apple and TRS-80 interfaces, 80 cpl, 150 cps, 7x5 or 7x10 matrices and graphics. Optional PROM chips for high-resolution graphics. Main U.K. agent Dataplus Ltd.

MX-80 *£425*
Impact, dot matrix, accepts any type of paper, Centronics parallel interface, optional serial and IEEE 488 interfaces, 44, 66, 80, 132 cpl, 80 cps, 9x9 matrix — 2.1 x 3.1mm. High resolution graphics.

EXTEL CORPORATION

M30 receive only keyboard send/receive and automatic send/receive *£895*
Impact, dot matrix printer, uses roll or fan-fold paper, V24 or 20mA interfaces, 80 cpl, 30 cps (50 with buffer) 5x7 matrix, 5- or 8-level operation. Main U.K. agent Extel.

M30 B208L keyboard send/receive *£1,270*
Dot matrix, uses roll paper, V24 or 20mA interfaces, 80 cpl, 30 cps, 5x7 matrix, 5- or 8-level operation. Main U.K. agent Extel.

FACIT

4520 and 4521 *£583*
Seven-wire print head, uses roll paper Telex type (Facit 4520), friction feed, fan-fold (Facit 4521) pin feed, serial, V24/RS323C, Centronics parallel interfaces, both fitted as standard, 80 cpl, 100 cps at 12 characters per inch, 9x7 matrix. Main U.K. agent Facit Ltd.

GENERAL ELECTRIC, U.S.A.

ITT 3330 *£1,496*
Impact dot matrix, pin feed, V24 interface, 132 cpl, 10, 20 or 30 cps, 7x9 matrix. Main U.K. distributor ITT Business Systems U.K.

HEATH ELECTRONICS

WH14 *£510*
Dot matrix, uses edge-punched fan-fold paper, 20mA, RS232C interfaces, 80, 96, 132 cpl, 132 cps, 5x7 matrix. Main U.K. agent Heath Electronics U.K. Ltd. (OEM sales).

INTEGRAL DATA SYSTEMS

Paper Tiger Model 460 — *from £700*
Dot Matrix, impact printer, pin-feed fan-fold paper, parallel, RS232C, 150 cps, 24x9 matrix. Main U.K. agent Teleprinter Equipment Ltd. and Microsense Computers Ltd.

LEAR SIEGLER INC

300 series — *from £965*
Dot matrix, uses standard paper, RS232C, 20mA parallel interfaces, Centronics 701/703 type 132 cpl, 180 cps, 9x7 or 9x9 matrices. Main U.K. agent Penny & Giles Data Recorders Ltd.

LOGABAX

LX-213 — *£1,590*
Dot matrix printer, plain paper, fan-fold or cut up to six-ply, RS232C or V24 interfaces, 132 cpl, 218 cpl, 180 cps, 9x7 matrix, optimised bi-directional printing. Main U.K. agent Brospa Data Ltd.

LRC EATON

7000+ — *£250*
Dot matrix printer, uses roll paper, RS232, IEEE, current loop and parallel interfaces, 20, 32, 40 and 64 cpl software selectable by option, 40 cps, 7x7 matrix. Main U.K. agent Russet Instruments.

MALIBU ELECTRONICS CORPORATION

Masterprint 165 — *£1,400*
Dot matrix, fan-fold paper, RS232C, current loop and parallel interfaces, 132 cpl, 165 cps, 10x9 matrix with 18x9 matrix character set which approaches word-processing quality, graphics. Main U.K. agent MBS Terminals Ltd.

MANNESMAN TALLY

Main U.K. agent Data Design Techniques Ltd

M-80 MC — *from £875*
Dot matrix, 9.5in. pin feed paper, all interfaces, 80/132 cpl, 200 cps, 7x9 or 9x9 matrices.

T1612 keyboard send/receive — *£1,612*
Dot matrix, single or multi-part paper, pin feed, RS232C or 20mA interfaces, 132/218 cpl, 160 cps, 7x9 or 9x9 matrices.

T1612 receive only — *£1,475*

T1602 — *£1,395*
Dot matrix single- or multi-part paper, pin feed, Data Products, Centronics and serial interfaces, 132 cpl, 160 cps, 7x9 matrix.

MICRO PERIPHERALS INC

MPI-88T — *£535*
Dot matrix printer, uses fan-fold, roll and cut-sheet paper, RS232C, current loop and parallel interfaces, 80/96/120/132 cpl, all software-selectable, 120 cps, 7x7 matrix. Main U.K. agent Russet Instruments.

NEWBURY LABORATORIES

Model 8300 — *from £475*
Dot matrix, pin-feed paper up to 9.5in., eight-bit parallel interface or CCITT V24, RS232C interfaces, 10 characters per inch, 125 cps, 7x9 matrix. Main U.K. agent Newbear Computing Store.

SHOPWINDOW

STOKE on TRENT

for
TUSCAN
and
TANGERINE
and
VIDEO GENIE + SOFTWARE
and
BOOKS

MICRO–PRINT Ltd.,
59, Church Street, Stoke on Trent.
(0782) 48348. Barclaycard and Access

● Circle No. 248

SUSSEX

SUPERBRAIN FROM £1550*
NEW TELEVIDEO SYSTEMS
multi-user, multi-tasking and communications
RANGE OF CP/M SOFTWARE
PRINTERS FROM EPSOM TO SANDERS
WE ARE ALSO A WORD PROCESSING BUREAU
** Subject to $ surcharge*

THE ELECTRONIC OFFICE
Phoenix Buildings
Regency Road ● 32 West Street
Brighton ● Tel: Brighton (0273) 722248/9

● Circle No. 249

5 DAY MICROCOMPUTER PROGRAMMING COURSES START EVERY MONDAY
INCLUSIVE COST £170
Part-time courses seven days a week
MICROTEACH
160 Edmund Street, Birmingham
Tel: 021-236 4322

● Circle No. 250

OKI Microline 80 printers £269
OKI Serial interface buffer 2K £73
OKI Serial interface with current loop .....plus £22
EPSON MX80 F/T £339
RS 232C Serial interface £45

MARLOW SUPPLIES
Regency House
Dedmere Road
Marlow, Bucks
Tel: Marlow (06284) 74511

● Circle No. 251

BUSINESS & COMPUTER SERVICES

292 Caledonian Rd., London N1 1BA.
Tel: 01-607 0157.
(24 hour Answering Service)

We are Micro-computer Consultants & Programmers and specialise in industrial & commercial programs written to client's specifications.

	VAT & Post Incl.
Cash Analyser	£20.00
Vehicle Cost Analyser	£25.00
Book Keeping (Min. 48K & 2 drives)	£150.00

Please ask us for fuller details of the above. All are disk based for the TRS-80 Model I or III. Please state your DOS when ordering. Apple II versions soon.

● Circle No. 252

MANUFACTURING SOFTWARE

- Bill of Materials
- Stock/WIP Control
- PWS System (Gross Pay Computation, Piecework, Operations, Cost Centres)
- Payroll and Accounting

CPM Compatible

Taylor Micro SYSTEMS LIMITED
HAMSTEAD INDUSTRIAL ESTATE,
OLD WALSALL ROAD, GREAT BARR,
BIRMINGHAM B42 1DF. 021-358 2436.

● Circle No. 253

REPAIRS

5 REM "TO GET YOUR VIDEO COMPUTER MONITORS & MICRO COMPUTERS REPAIRED"
10 OUTPUT FAULTY VIDEO MONITORS
20 OUTPUT FAULTY MICRO COMPUTERS
30 GOTO CALPAR ELECTRONICS LTD LILAC CRESCENT BEESTON NOTTINGHAM NG9 1PX PHONE 0602258335
40 PAUSE
50 INPUT REPAIRED UNITS
60 IF INTERESTED IN OUR SERVICES THEN CIRCLE THE REPLY NO. OF THIS AD. AND POST TODAY PLEASE.

● Circle No. 254

MICROCASE

"turns a board into a real computer"

For NASCOM 2
COMPUKIT
SUPERBOARD
ALSO UNCUT FOR NASCOM 1 ETC.

Direct from us or from your dealer — but make sure you see a

GENUINE MICROCASE

SIMPLE SOFTWARE LTD
15 HAVELOCK ROAD
BRIGHTON, SUSSEX BN1 6GL
(0273) 504879

● Circle No. 255

NIPPON ELECTRIC COMPANY

Spinwriter *£1,500*
Combines golf-ball daisywheel and thimble mechanism, uses continuous or single-sheet computer paper, RS232C serial (RO and KSR), Centronics-compatible and Diablo-compatible interfaces, 8080 input bus line, current loop, 55 cps, solid-font matrix. Main U.K. agent Memec Systems Ltd.

OKI

Microline 80A *£299*
Dot matrix, 9x7, 80 cps, 80 or 132 cpl, pin, traction or friction feed, RS232, 20mA Centronics. Main U.K. agent X-Data.

Microline 82A *£399*
Dot matrix, impact printer, 80 cps, bi-directional logic-seeking, 40, 66, 80 or 132 cpl, pin, friction or tractor feed, serial and parallel interface, 160 characters. Main U.K. agent X-Data.

QUME

Sprint 5/45 receive only *£1,795*
Daisywheel mechanism, uses plain paper, fan-fold or cut appear A4 up to six-ply, RS232C or V24 interfaces, 156 cpl at 12 pitch, 45 cps. Main U.K. agents, Access Data Communications and ISG Data Sales.

RAIR

Main U.K. agent Rair Ltd

820/825 Desk-top printer *£1,090*
Dot matrix, RS232C interface, 132 cpl, 75 or 150 cps, 7x7 matrix.

DecWriter IV keyboard printer, KSR and read only *£795*
Dot matrix, uses standard listing paper, RS232C current loop interface, 215 cpl, 30 or 180 cps, 9x7 matrix.

M200 *£1,995*
Dot matrix, uses continuous paper, parallel or serial interface, 132 cpl, 340 cps, double 7x9 matrix.

DecWriter III *£1,550*
Dot matrix, uses continuous listing paper, RS232C or 20mA, current loop interfaces, 132-215 cpl, 180 cps, 7x7 matrix.

RICOH

RP-1600 *£1,295*
Daisywheel, uses single-sheet or continuous paper, Centronics and compatible interfaces, 132 cpl, 60 cps. Main U.K. agent Nexos (U.K.) Ltd.

ROXBURGH PRINTERS

X80 SP printer/plotter *from £896*
Dot matrix, impact printer/plotter, pin-feed, fan-fold paper, RS232C, IEEE488, CBM, Centronics, HP85, 20mA, Tektronix, 80/96 cpl, 100 cps bi-directional, 8x8 matrix, three character generators, various other generators. U.K. dealer Roxburgh Printers Ltd.

RP 8031 *from £163*
Dot matrix, impact printer, Tally roll, parallel, RS232C, 20mA, 21 cpl, 150 lpm, 5x7 matrix, sprocket-feed option for labels. U.K. dealer Roxburgh Printers Ltd.

RP 8040 *from £182*
Dot matrix, impact printer, Tally roll, parallel, RS232C, 20mA, 40 cpl, 72 lpm, 5x7 matrix, sprocket-feed option for labels. U.K. dealer Roxburgh Printers Ltd.

S FARID (SPECTRONICS) MANUFACTURING

TP-40 and TP-65 receive only *from £660*
Thermal, matrix, uses thermal paper, cost of paper £1.80 each roll, seven-bit parallel interface, push-button control and self-test, 40 or 64 cpl, 13 or 18 cps, 7x5 dot matrix. Main U.K. agent S Farid (Spectronics) Manufacturing Ltd.

TALLY

Main U.K. agent Data Design Techniques Ltd
T1612 keyboard send/receive *£1,612*
Dot matrix, pin-feed, single- or multi-part paper, RS232C or 20mA interfaces, 132-218 cpl, 160 cps, 7x9 or 9x9 matrices.

T1612 receive only *£1,475*
T1602
Dot matrix, pin-feed, single- or multi-part paper, Data Products, Centronics and serial interfaces, 132 cpl, 160 cps, 7x9 matrix.

TELETYPE CORPORATION

Model 43 keyboard send/receive *£800*
Impact matrix printer, uses pin-feed or friction-feed, dual RS232C and 20mA current loop interfaces, 132 cpl, 30 cps, 4x7 matrix on nine-wire printhead. Main U.K. agent Geveke Electronics Ltd.

TEXAS INSTRUMENTS

Main U.K. agents Texas Instruments and Rair Ltd
OMNI 800 series *from £1,090*
Models 810, 820 and 825 *to £1,650*
Dot matrix printers, uses paper, EIA, current loop, parallel interfaces, 132-216 cpl compressed print (models 820 and 825), 132 cpl (model 810), 75 cps (model 825), 150 cps (models 810 and 820), 9x7 matrix.

Silent 700, model and 745 portable *£1,250*
Thermal mechanism, uses thermal paper at £1.50 per 100ft. roll, integral acoustic coupler, EIA interfaces, 80 cpl, 30 cps, 5x7 matrix.

Silent 700, 743 Keyboard send/receive version *£1,105*
Thermal mechanism, uses thermal paper at £1.50 per 100ft. roll, EIA, 20mA current loop interfaces, 80 cpl, 30 cps, 5x7 matrix.

TRANSDATA

313 Receive only *£790*
Dot matrix mechanism, uses thermal paper at £60 per box of 24 rolls x 150ft. RS232C and parallel interfaces, designed for use as VDU hard copy, 80/132 cpl, 30 to 45 cps, 7x5 matrix. Main U.K. agent Transdata Ltd.

TRANSTEL COMMUNICATIONS

AR receive only *P.O.A.*
Dot matrix, uses standard teleprinter paper, V24, current loop interface, 80 cpl, 30 cps, 7x5 matrix. Main U.K. agent Transtel Communications Ltd.

UNIVERSITY OF MANCHESTER MICROCOMPUTER ADVISORY SERVICE

Weekend residential courses on microcomputing

MICROCOMPUTER PROGRAMMING FOR BUSINESS APPLICATIONS
An introductory course in BASIC
2nd-4th April 1982

AN INTRODUCTION TO BUSINESS PROGRAMMING IN PASCAL
3rd-5th September 1982

For full details contact:
Dr David Jackson,
University of Manchester,
Manchester M13 9PL.
Tel: 061-273 3333, ext 3206.

● Circle No. 256

MICRO ADS
are accepted from private readers only, pre-paid and in writing, 20p per word, minimum charge £2.
Please make cheques payable to Practical Computing and send to Room L310, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

ATOM 12+12. Acorn built, with psu, all leads, much software inc. "Invaders", "Pinball". Magic book, manual. £240, will negotiate. Tel: (0783) 227969 after 5pm.

TRS-80, 16K, Level 2, over £100 software. £290 ono. Tel: 061-330 4615.

16K ZX-80. Sinclair built, PSU, leads, manual. £100. Tel: Swindon 723460 evenings.

IBM GOLF-BALL 3982 console printer with cables and interface for P.E.T. for sale. £500 plus VAT. Buyer calls. Tel: 0934 838187, Mr. Day, 17 Elm Close, Yatton, Bristol.

ZX-81 (16K) G.C.E. "O" LEVEL MATHS on cassette. "MATHS 1" teaches differentiation, integration, multibase arithmetic, matrices plus inverses; and generates questions. "MATHS 2" ranges over the whole syllabus with 30 multiple choice questions, 90% of which are generated. "MATHS 3" is in the same format as "MATHS 2". Explanations of answers are given in all programs. Order No. ACOM 3. Price (entire package) £4.50. Cheque with order to: Rose Cassettes, 148 Widney Lane, Solihull, West Midlands B91 3LH.

NASCOM SOFTWARE: Standard Z-80 assemblers with NAS resets 5.7K cassette £12, 8. 5K D DOS £18; Word processors 3K cassette and 4K D DOS £18; 2K position independent debus £9; 2K relocatable dis assembler £11; D DOS card index/catalogue simulator £15; Hybrid BASIC (not sold separately) D DOS or cassette £4. Details SAE, Mr. P. Watson, 101 Village Road, Bromham, Bedford MK43 8HU.

TRS-80 16K level 2 programs: Meteors and Morse Code with sound, Real Time spaceship lander (random landscapes). £4. To Whitehouse, 4 Fernwood, Marple Bridge, Stockport.

TI99/4 with cassette interface, colour graphics, sound, offers around £250. Neil, 0923 81637.

FOR SALE ZX-80 and 16K RAM, Sinclair built, PSU, manual, £110 o.n.o. Cardiff (0222) 593669.

ZX-80 for sale. Plus memory expansion, cassette recorder PSU and all leads. Price £90 o.n.o. Phone: 021-622 4528 during 5-8pm.

HALF PRICE SHUGART 8" 2 drives. S.S.SD fully aligned and tested, can be seen working. Post or collect, £180 each. Phone: 076-727-427 evenings or weekends.

FOR SALE: ITT 2020, 32K, Palsolf, colour card and T.V. modulator included. £550. Phone 0704 66156 (evenings).

S-100 — Vector Graphic Mainframe (Cabinet / PSU / motherboard), £205: SSM 2708/2716 Eprom Programming Board, £66; other boards to clear. Phone Crawley 515201.

TRS 80 LEVEL II, 48K expansion interface, Percom data separator, Video, Dust Covers, Cassette Recorder all housed in Tandy desk unit. Centronics printer on separate stand with spare ribbon cartridges. Micropolis twin disc drive (390K). Discs:- TRS DOS, NEWDOS. Tapes:- In Memory Information System, Advanced Statistical Analysis, Corplan Business Game. All instructions books and manuals. Total cost new £4,200. Accept £1,500 ono or offers for individual items. Can deliver. Phone George Steele at Lye 3842 during office hours.

43 KSR Teletype Printer. Terminal hardly used. Offers. Telephone 01-637 5591 daytime.

TRS 80 LEVEL II, 16K, cassette, Mainframe, Teletype Printer with paper. Manuals. £450 ono. 01-644 5525.

SUPER GEOGRAPHY needs Apple II 48K with disk drive. R. Trimner, 27 Conesworde Road, Dunstable, Beds.

CBM 3032 c/w cassette, toolkit, software, accessories/manuals. £480 ono. Anadex DP8000 c/w interface/manual. £285 ono or £750 ono complete system. Tel: 0642 580513.

SORD M223 64K, two 350K disk drives, cover, extensive software including W.P., Compiler and EBasic. £2,000. 01-552 6026 (evenings).

GAMES FOR CBM8032. Hangman — a game with words. Hed-Banger an infuriating game with numbers. Both games on one cassette for £5.75 incl. J. Bottoms, 17 Wreford Close, St. Columb Major, Cornwall TR9 6SE.

ITHACA S100 BOARDS: 4MHZ Z80 CPU £70; 16 x 64 Video £70; 16/32K Eprom £60; 8K RAM 4MHZ £35; 11 Slot Mother £60; 2 Prototype £25 ono. All with manuals. Burton-on-Trent 44549 after 6.30pm.

TANDY TRS80 Model 1 with 16K CPU; Expansion interface; VDU; cassette, matrix printer, and all necessary cables. Today's price £1,158, will accept £700 ono. Printer only £200. 021-454 7224.

ZX81 FOR SALE, 16K RAM, PSU, manual, some software. £120. Ring 01-318 2485 evenings.

APPLE II PLUS 48K (£935 new, 18 months old) including £100 games, £600 or reasonable offer. Tel: 0538 52648 after 7pm.

UNITED SYSTEMS CORPORATION

Main U.K. agent Aviquipo Ltd

DigiTec 6320 *£483*
Electro-sensitive dot matrix, electro-sensitive line roll paper at £1.80 per roll, RS232C or isolated 20mA current loop, 21 or 32 cpl, prints two lines per second, 1,200 Baud receive, 5x7 matrix.

DigiTec 6330 *£421*
Dot matrix, electro-sensitive paper at £1.80 per roll, 8-bit parallel/character serial, 21 or 32 cpl, 5x7 matrix.

DigiTec 6410 *£237*
Dot matrix, electro-sensitive paper at £1.80 per roll, RS232C or 20mA current loop, 21 or 32 cpl, two lines per second, 5x7 matrix.

DigiTec 6420 *£237*
Dot matrix, electro-sensitive paper at £1.80 per roll, 8-bit parallel serial, 21 or 32 cpl, prints two lines per second, 1,200 Baud receive, 5x7 matrix.

DigiTec 6450 *£266*
Dot matrix, thermal paper at £1.80 per roll, RS232C 20mA current loop, 21 cpl, prints two lines per second, 110 or 300 Baud receive, 5x7 matrix.

DigiTec 6460 *£266*
Dot matrix, thermal paper at £1.80 per roll, eight-bit parallel serial 21 cpl, two lines per second, up to 1,000 Baud receive, 5x7 matrix.

DigiTec 6550 *£289*
Dot matrix, thermal paper at £1.80 per roll, RS232C or 20mA current loop, 21 or 32 cpl, prints two lines per second, 110 or 300 Baud receive, 5x7 matrix.

VECTOR GRAPHIC

MP printer *£599*
Uni-directional seven-wire x five-column dot matrix, original and one copy, maximum paper thickness 0.2mm., uses pin-wheel paper feed, 70 lines per minute, 150 cps, TTL level interface, two parallel output ports and one-parallel input port. Main U.K. agent Almarc Data Systems Ltd.

WALTERS MICROSYSTEMS

Dolphin BD-80P *£525*
Impact, dot matrix, adjustable sprocket feed, any one of three interface choices, 10 characters per inch, 80 cpl, full ASCII character set, self-testing, 64 graphics characters, 9x7 and 11x7 matrices, double-width characters, bi-directional printing. Main U.K. dealers Texas Instruments or Walters Microsystems.

Dolphin BD-136 *£560*
Impact, dot matrix, forms tractor, fully interfaceable, 136-226 column width, full graphics capability, 7x9, 9x9 matrices, 32 user-definable characters plus full ASCII set, data-formatting functions, fully logic seeking, self-testing. U.K. dealers Nexos.

WENGER DATENTECHNIK

Sole U.K. distributor Access Data Communications Ltd

Print Swiss Matrix Printer *from £700*
Dot matrix RS232C, 20mA, 60mA and parallel interfaces, Centronics-compatible, 80 cpl, constant throughout 80 cps, 55-1000 lines per minute, 7x7 matrix. KSR version also available.

Penny & Giles hard copies *from £365*
Electro-static RMP paper 127mm. x 70m. at £3.50 per roll, RS232C, current loop option, 80/40/20 cpl, 80 columns, 110 lines per minute, 8x5 line printer, 5x7 message printer matrix.

WHYMARK INSTRUMENTS

Main U.K. agent Whymark Instruments Ltd

Model 201 *£440*
Dot matrix, Tally-roll paper printer, IEEE, RS232C, serial, and parallel interfaces, 40 cpl, 40 cps, 52 character set with four-character sizes.

Model 204 label printer *£515*
Dot matrix, impact printer for self-adhesive labels, IEEE, RS232C, serial and parallel interfaces, 40 cpl, 40 cps, 52 character set with four-character sizes.

Model 3011 ticket/form printer *£690*
Dot matrix, plain paper, options automatic date and time, IEEE, RS232C, 40 cpl, 40 cps, 52 character set with four character sizes.

Model 501 rack-mounting printer *£625*
Dot matrix plain paper, options automatic date and time, IEEE, RS232C, 40 cps, 40 cpl, 52 character set with four character sizes.

Model 801 80/120 column printer *£750*
Dot matrix, plain or fan-fold paper, proportional spacing up to 120 cpl, 120 cps, bi-directional printing, user-definable character set, up to 4K selectable character fonts, graphics, and user-definable characters, also available; very large characters seven lines high.

Alphabetical list of suppliers

Supplier	Address
Access Data Communications Ltd, 0895-30831	Unit 17, Eskdale Road, Uxbridge Industrial Estate, Uxbridge, Middlesex UB8 2RT.
Almarc Data Systems Ltd, 0602-625035	906 Woodborough Road, Nottingham NG3 5QS
Anadex Ltd, 025672-3401	Weaver House, Station Road, Hook, Hampshire RG27 9HU
Aviquipo of Britain Ltd, 0628-34555	St. Peter's Road, Maidenhead, Berkshire SL6 7QU
Cable and Wireless 01-928 0261	83 Blackfriars Road, London SE1 8HQ
Cifer Systems Ltd, 0225-704502	Avro Way, Bowerhill, Melksham, Wiltshire SN12 6TP
Clary Ltd, 01-680 2222	12-14 Lower Addiscombe Road, Croydon, Surrey CR9 6AG
Comma Computers, 0277-811 131	West Horndon Ind Park, West Horndon, Essex CM13 3MJ
Dacoll Engineering Services Ltd, 0438-4381/0506-56565	Gardners Lane, Bathgate, West Lothian
Datac Ltd, 061-941 236/2	Tudor Road, Broadheath, Altrincham WA14 5TN
Data Design Techniques Ltd, 01-207 1717	12 Leeming Road, Borehamwood, Hertfordshire WD6 4DU
Data Dynamics, 01-848 9781	Data House, Springfield Road, Hayes, Middlesex
Data General Ltd, 01-572 7455	3rd and 4th Floors, Hounslow House, 724-734 London Road, Hounslow, Middlesex TW3 1PD
Dataplus Ltd, 0242-30030/37373	39-49 Roman Road, Cheltenham GL51 8QQ
Datatrade Ltd, 0604-22289	17 Billing Road, Northampton NN1 5AW
Davinci Computers Ltd, 01-952 0526	65 High Street, Edgware
Diablo Systems Ltd, 04862-71991	Regent House, 20 The Broadway, Woking, Surrey GU21 5AP
Digitronix Ltd, 0908-566888	10 Burners Lane, Kiln Farm Industrial Estate, Milton Keynes
DRG Business Machines, 0934-415398	13-14 Lynx Crescent, Winterstoke Road, Weston-super-Mare, Avon.
Electrographic AV Ltd, 01-573 1826	Printinghouse Lane, Hayes, Middlesex UB3 1AP

SHOPWINDOW

APPLE II . . . 32K . . . Colour Card. Applesoft Card. Cassette + Tapes. Mint condition. £550. Tel: 01-636 8748 after 7pm.

COMMODORE VIC-20 software. Six games on tape. Send cheques for £4.50 to J. Last, 46 St Katherine's Lane, Snodland, Kent ME6 5ER.

TRS-80 16K L2, with CTR-80 cassette, manuals, games, program books, only 3 months old, £330. Tel: Canvey Island 696544.

TRS-80 16K Level 2, screen, recorder, manuals, software, all as new, £400. Tel: 01-624 5404 (London).

HIGH QUALITY printer listing for your TRS-80/ Video Genie, programs 1p per line, £1 minimum, your tapes/discs returned post free. Cheque/P.O. to: J & P Computer Services, 3 Pool End Road, Tytherington, Macclesfield, Cheshire.

ZX-81 USERS. Build your own 16K RAM extension and save money. For full circuit information and instructions to build this digital masterpiece. Send cheque or postal order for £1 only to: Microtex, Freepost, Hull.

ATOM SOFT DISPLAY (10K TOTAL). Mix high-resolution graphics with text (23 lines) including electronic, mathematical, Greek, upper and lower case letters. Also program your own characters. On cassette for £5 from: 5 The Croft, Clevedon, Avon.

PET PROGRAMS (N. ROM): 3-D Maze, O. A. Bandit, Bool (produces truth table for boolean expression), 50 x 80 Graphics (M/C), 40 x 200 Barplot (M/C). £4.50 each, free game included. Specify machine size. Mr. D. M. Coghlan, 12 Yew Close, Barkham Road, Woosehill, Wokingham, Berks RG11.

TRS-80 16K Level 2, screen and manuals, £360 ono. Tel: Culcheth 2985 (Cheshire).

TASK SYSTEM. Consisting of 56K processor (twin 8" disk drive 2MB), Cifer VDU and NEC spinwriter. Sale due only to company takeover, installed but never gone live, complete with fully integrated retail accounting system suitable for retail outfit with 4/5 branches, cost over £13,000, offers invited around £8,000. Dockers Furniture Ltd, 20 Blatchington Road, Hove, Sussex. Tel: Brighton 776377.

5 VIC PROGRAMS. Killer Park, Life, Starseed, Gobbler, VicMusik. All for £6.50 on cassette. SAE for details and free game to: Soft Toys, 14 Lockharton Avenue, Edinburgh.

VIDEO GENIE 16k, 6 months old, virtually unused, excellent condition, selling because upgrading, £275. Tel: 01-568 1185 (day), (09904) 2698 (night).

1K ZX81 PACK 1: Moonlander, Dodgems, Mastermind; £1. PACK 2: Hangman, Sub Hunt, Super Bowl, Bomber Attack; £1.35. Both as listings — instructions. Also some 16K. S.A.E. for details. G. Smith, Brynllwyd, Capelseion, Aberystwyth.

SUPERBOARD II, 8K, nicely cased, PSU, manuals. £120. Aldridge, West Midlands. 0922 53574.

SWTP 6800 COMPUTER, 24K twin minidisks, CT64 VDU, software and manuals. £1,200. Offers invited. 0788 87629.

SHUGART SA400 disc drive, almost new, excellent condition, with full documentation. £85. Tel: Romsey (0794) 514775.

ZX81 RUBIK SOLVER. Listing plus instructions, £2.50. On cassette, £5.50. A Page, 6 St Leonards Avenue, Hayling Island, Hants.

UK101, REPORICLE, a tiny editor, interpreter, compiler for writing video games. Supplied with a fast machine code game called KAMIKAZE and a comparison BASIC program called DEATH STAR. Unsuitable for WEMON. £13 inclusive. N. Johnstone, 59 Copeland Avenue, Mirehouse, Whitehaven, Cumbria.

DO YOU OR YOUR NASCOM NEED SOME MORE ADVENTURE IN YOUR LIFE? . . . Provided you're running NAS-SYS, you're in luck!!! For details of the latest machine code adventures, write to:— Adventure, Triggabrowne, Tilford Road, Rushmoor, Farnham, Surrey.

VIDEO GENIE TRS 80, MICROTAN 65, UK101 OWNERS: We have input/output ports, programmable sound generator, Epsom programmers and lots more for your computer. SAE for info/price list to: Mr. B. Mistry, 75 St. Margaret's Road, Bradford BD7 2BY.

TRS-80 MODEL 1 new Tandy Disc Drive for sale. Offers considered. Tel: 061-445 7191.

ACORN ATOM 24K. Colour, PSU, programs, books, Invaders. Worth £300+ only £199. Phone: Sedgefield 20403 after 5.15 pm.

WANTED — TRS-80 MODEL 1 LEVEL 2, 16K or over, with or without monitor, cassette, printer etc. Preferably working. Please telephone 03955-3501 (Sidmouth Area).

ZX-80 & 81 DISASSEMBLER. Send £5.50 for the 12K listing to:— C. Galbraith, A/1F 05 Cabin, H.M.S. Gannet, Prestwick Airport KA9 2RZ.

PHILIPS VIDEO N1700 with stocks of tapes. Little used. Wish exchange for Pet Commodore computer with large keyboard 32K upwards with available programmes. Additional accessories (printers, etc) negotiable. 01-907 2932 or write: S. Valibhai, 20 Northwick Circle, Harrow, Middx.

SORCERER 32K with manuals, user group magazines and UHF modulator. Also toolkit, chess, disassembler, Asteroids etc. £450 ono. Phone: Waltham Cross 28877.

SUPERBOARD II 8K with manuals PSU and UHF modulator, plus software. £150 ono. Phone: Waltham Cross 28877.

48K SORCERER, basic Rompac, toolkit disassembler, VHF output, high-res, programmable characters, utilities, games, manuals, leads, £475. Tel: Ashley Niblock (0203) 412193, evenings.

APPLE II PROGRAMS ON DISK — £10, Maze (rescue maidens before monster), Ski-run, graph trig functions (all HGR), music. M. Hambly, 1532 Stratford Road, Hall Green, Birmingham 28.

UNOPENED ZX-81 FOR SALE. Includes guarantee. Ring Barry 01-458 5565 anytime.

NASCOM 1 WITH PSU, 16K, Veroframe, portable TV, cassette player, assembler, £180. Tel: 0246 36958.

MIDELECTRON M62 paper tape punch and reader. 5 and 8 bit read and punch, £775. Tel: 061-427 7985.

ZX-81 PROGRAMS — maths, home use — 20 assorted listings, £1.50 including postage. A. Montague, 89 Oban Drive, Glasgow G20.

Extel, 01-739 2041	Engineering Division, The Exchange Telegraph Company Ltd, 73-75 Scrutton Street, London EC2 4TA
Facit Ltd, 0634-40172/7	Maidstone Road, Rochester, Kent
Fortronic Ltd, 0383-823121	Donibristle Industrial Estate, Dunfermline
Geveke Electronics Ltd, 04862-71337	RMC House, Vale Farm Road, Woking, Surrey
Heath Electronics (U.K.) Ltd, 0452-29451	Bristol Road, Gloucester GL2 6EE
ISG Data Sales Ltd, 95-57955	Unit 9, Fairacre Industrial Estate, Dedworth Road, Windsor, Berkshire
ITT Electronic Services, 0279-26777	Edinburgh Way, Harlow, Essex
ITT Business Systems, 0273-507111	Crowhurst Road, Hollingbury, Brighton BN1 8AN
Kode Services, 0249-813771	Station Road, Calne, Wiltshire SN11 0JR
Maclin-Zand Electronics Ltd, 01-837 1165/01-278 7369	38 Mount Pleasant, London WC1X 0AP
MBS Terminals Ltd, 09323-53151	Aldwych House, Madeira Road, West Byfleet, Surrey KT14 6BA
Memec Systems Ltd, 084421-3149	Park Industrial Estate, Thame, Oxon
MIBF 0734-415191	Barclays Bank Chambers, Pegg Lane, Kirkgate, Tadcaster, North Yorkshire
Microbyte, 01-278 7369	Unit 9-10, 1st Floor, 38 Mount Pleasant, London WC1X 0AD
Microsense Computers Ltd, 0442-48151/41191	Finway Road, Hemel Hempstead, Hertfordshire HP2 7PS
Newbear Computing Store, 0635-30505	49 Bartholomew Street, Newbury, Berkshire
Nexos U.K. Ltd, 084421-3151	3 Jefferson Way, Thame, Oxfordshire OX9 3FU
Penny & Giles Data Recorders Ltd, 042-5271 511	Mudeford, Christchurch, Dorset BH23 4AT
Peripheral Hardware Ltd, 01-941 4806	Armfield Close, West Molesey, Surrey
Rair Ltd, 01-836 4663	30-32 Neal Street, London WC2H 9PS
Robox Office Equipment Ltd, 041-776 4388	84 Townhead, Kirk in Tiloch, Glasgow, Scotland
Roxburgh Printers Ltd, 07973-3777	22 Winchelsea Road, Rye, E. Sussex TN31 7BR
Russet Instruments Ltd, 0734-868147	Unit 1, Nimrod Way, Nimrod Industrial Estate, Reading, Berkshire RG2 0EB
S. Farid (Spectronics) Manufacturing Ltd, 02013-77337	Dawkins Road, Industrial Estate, Poole, Dorset BH15 4JY
SEN Electronics 09328-66744	5 London Street, Chertsey, Surrey
Sintrom Electronics 0734-85464	14 Arkwright Road, Reading, Berkshire RG2 0LS
Stack Computer Services Ltd, 051-933 5511	290-298 Derby Road, Bootle, Liverpool L20 8LN
Teleprinter Equipment Ltd, 044282-4011/9	Akeman Street, Tring, Hertfordshire HP23 6AJ
Terminal Display Systems Ltd, 0254-662244	Hillside, Whitbrik Estate, Blackburn, Lancashire BB1 5SN
Texas Instruments Ltd, 0234-67466	Manton Lane, Bedford MK41 7PA
Transdata Ltd, 0705-486556	11 South Street, Havant, Hampshire
Wilkes Computing Ltd, 0272-25921	Bush House, 72 Prince Street, Bristol BS1 4HU
Whymark Instruments Ltd, 07372-21753	6 Holmsdale Road, Reigate, Surrey RH2 0BQ
X-Data 0753 49117	Marish Wharf, St Mary's Road, Langley, Slough, Berkshire SL4 1HE

FREE
LIBRARY BOX with every TEN-PACK
****PLUS****
NEW DISK DIRECTORY & DISKWRITER when ordering two packs or more
****PLUS****
BRUSHED CHROME PAPERMATE PEN when ordering 5 — 9 TEN-PACKS
****OR****
GOLD PLATED PAPERMATE PEN when ordering 10+ TEN-PACKS.

DISKING

FOR THE FINEST MINIDISKS & ACCESSORIES

All disks are factory fresh and individually certified 100% error-free.

DISKING INTERNATIONAL FREEPOST LIPHOOK HANTS GU30 7BR UK TEL(0428)722563

5¼" MINI DISKS

Datalife minidisks

VERBATIM The World's favourite media 'Datalife' are all double density with hub ring reinforcement.

	EXC VAT
MD525 S/Sided 40 track	£18.95
MD550 D/Sided 40 track	£24.95
MD577 S/Sided 77 track	£26.95
MD557 D/Sided 77 track	£34.95

10 & 16 Hard Sector at same prices

MEMOREX The Ultimate in Memory Excellence based on many years of experience with recording media.

	EXC VAT
MEMX 1S/S S/Density	£18.45
MEMX 1D S/S D/Density	£21.45
MEMX 2D D/S D/Density	£23.95

10 & 16 Hard Sector at same prices

BASF cross-linked Oxide coating for long media life and special lubricants minimise head wear.

	EXC VAT
BASF 1 S/S S/Density	£17.95
BASF 1D S/S D/Density	£21.45
BASF 2D D/S D/Density	£25.95

10 & 16 Hard Sector at same prices

DISKING SUPERLUXE DISK LIBRARY

Manufactured exclusively for us to our own design, the SDL keeps your valuable disks flat & dust free, while at the same time allowing you instant visual selection of any single disk. The standard SDL holds 20 disks, while the SDLX holds 28 disks. The SDL may be uprated to an SDLX retrospectively.

SDL only	£8.65
SDLX only	£10.39

DISKING DISKMAILERS

This product also exclusively ours, is a strong plastic envelope for mailing one, two or three disks, in safety and comes complete with warning labels & address labels.

DM only	50p

DISK DRIVE HEAD CLEANING KITS

Prevent head crashes and ensure efficient error-free operation Enough for 26 bi-monthly cleans & a lot cheaper than a service call!

CK5 only	£16.50p

ALL PRICES ARE EXCLUSIVE OF VAT, PLEASE ADD 15%

SUPERBRAIN SOFTWARE

DATAKING' coming soon: will mathematically massage any Datastar or Wordstar data file, and columnate with report writer. Instant Sales, Nominal or Purchase ledger or Comprehensive Sales/Purchase Reporting for Datastar users.

DATAKING only	£49.00
DATAKING User Manual	£2.50

PLASTIC LIBRARY BOXES

The genuine Egly Box that stores and protects your disks in tens — Unbeatable — (FREE with every ten disks ordered)

LB only	£1.90

ATTENTION THE TRADE

Please write to us on your letter headed paper, and ask for our special trade prices and offers.
Give your software the ultimate in presentation. We can make the SDL & SDLX in your colour PVC, with your logo. Sample plastics swatch available free by request.

U.K. P&P RATES	EXC. VAT
Discs (1-5 PACKS) each pack at	95p
Disks (6+ PACKS) each pack at	65p
SDL or SDLX	at 95p
DM (each at 25p) Tens	at 80p
LB	at 45p
CK5	at 75p
DATAKING SOFTWARE	post free
DATAKING USER MANUAL	post free

URGENT ORDERS

Either post your cheque not forgetting to stamp it first-class, or telephone your order with credit card No., mentioning in either instance that your order is URGENT. You may then pay FIRST CLASS POST for your goods, if required.

FIRST CLASS RATES	EXC VAT
First TEN-PACK	£1.80
Second & subsequent	£1.30

NORMAL ORDERS

We accept Armed Forces and all Ministry of Defence Establishments orders over £50.00 in value. All other customers cheques with order please payable to DISKING. If you are a large establishment, and cannot raise cheques without an invoice, please post or telephone us your order, and we will send a proforma invoice by return, for your accounts department to pay against.

CREDIT CARD ORDERS

We accept Barclaycard and Access card, and make a small surcharge of 6%, on the total order value. You may write your c/card No. on your order or telephone the order, day or night, 365 days a year. You may speak for as long as you like, and don't forget to give full details of what you wish to purchase, your credit card number, credit card holder's name & address, and delivery or invoice address if different.

DISKING FREEPOST, Liphook, Hants, GU30 7BR. England.

QTY	DESCRIPTION	PRICE EXC. VAT

TOTAL GOODS VALUE EXC. VAT	£
TOTAL DELIVERY AND INSURANCE	£
SUB TOTAL EXC. VAT	£
VAT	£
VALUE OF CHEQUE PAYABLE TO DISKING	£

Name:

Address:

PC 3/82 Tel No:

My Access/Barclaycard* Number is:

**Please delete that which is not applicable*

● Circle No. 261

LONDON COMPUTER CENTRE

NEW! from Tele Video
EMPEROR 11 £2,150

made under licence for Micro Video Ltd., world wide distributors of the Emperor range of micro computer Business Systems.

- ★ Expandable to multi-user system and hard disks.
- ★ Superbrain compatabillty.
- ★ CPM operating systems 64K Ram. Real Time Clock.
- ★ Detachable keyboard with 12 function keys (Wordstar option).
- ★ Green screen — true decenders.
- ★ Built in 1 Mbyte dual disk drives.
- ★ Full graphic capabilities.
- ★ OPTIONS.
- ★ 10m Hard disk £1,995.
- ★ Expandable up to 6 users, multi-tasking system with Emperor 20 (10m byte hard disk) 64K processor, back-up floppy disk £4,500.
- ★ Plus each user terminal with 64K Ram, only £1,050.

Dealer Enquiries Invited. Demonstrations on all models.

The SPECIAL LCC APPLE SYSTEM

48K Apple Dual 40 Track Disk Drives & 12" Green Screen Monitor £1,395

80 Column card with Decenders	£135
CPM Softcard	£95
16K (Integer) Card	£65
Centronics Parallel Card	£75
Serial Printer/Communications Card	£75

AUTO SHEETFEEDER £580

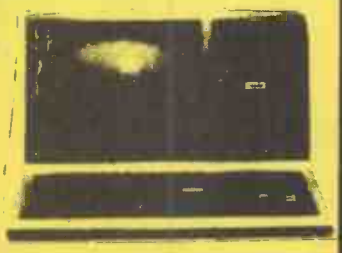
New! 12" wide Automatic Sheet Feeder fits all below

EPSON
MX-80 FT
MX-80 FT2
MX-100

SUPERBRAIN
WITH NEW EXTRA FEATURES FROM £1,795

AUTHORISED TANDY DEALERS

Model I	Model II	Model III
48K System	with CPM	16K £650
2 Disk Drives	*and* TRS DOS at	48K £695
Green Screen	no extra charge	48K with disk
Complete £995	from £1,995	drives £1,350

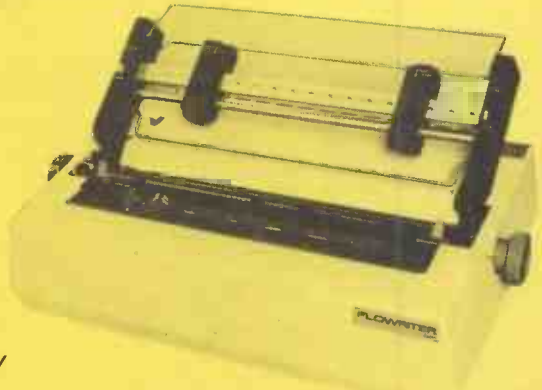


PET! APPLE! TRS80! HORIZON! OWNERS!

Let LCC — the BIG COMPUTER CENTRE — put you a cable's length away from **LETTER QUALITY PRINTING** with 7 Star Printers.

Olivetti ET21. 20 CPS. Doubles as typewriter	£795
TEC 40. 40 CPS. JAPANESE DIABLO 630 uses Diablo Daisy Wheel & Ribbons	£1,235
Daisy Wheel II 60 CPS. RICOH 1600 Daisywheel	£995
Qume SPRINT 5. 45 CPS.	£1,350
FLOWRITER RP 1600 60 CPS. The most intelligent Daisy 8K Buffer/Bi Directional Printing X ON/OFF. Right justify Repeat Built-in	£1,500
NEC. 55 CPS.	£1.650
FUJITSU 80 CPS. Plastic/Metal wheels	£1,695

DEMONSTRATIONS ON ALL MODELS



ALL PRICES ARE EXCLUSIVE OF VAT AND DELIVERY
DEALER ENQUIRIES INVITED ON ALL PRODUCTS

43 GRAFTON WAY, LONDON W1P 5LA (Opposite Maples)
OPENING HOURS: 11-7 MON-FRI 12-4 SAT Tel: 388 6991/2
24 hour answer phone: 01-388 5721

● Circle No. 262

Continuing our series from *The War Machine*, Chris Dempsey reviews a historical simulation.

D-DAY

GAMES PLAYERS look to their computers to provide a ready-made opponent at any time of the day or night. The computers themselves are always ready to oblige, of course, but many commercial games programs turn out to be a sad disappointment. The D-Day program from Computer Simulations is a welcome exception to this pattern which goes some way to redress the balance.

D-Day is a historically faithful simulation of the Allied landings in 1944. The human player controls the Allied forces, while the computer controls the German ones. It is played on two overlapping maps of northern France that show differing terrain and towns, which are depicted by various alphabetic characters. It is somewhat confusing at first, but you soon understand what each character means.

Victory tables

The package consists of three separate programs: an historical descriptive program of about 9K, which is really quite superfluous; an animated 12.3K rules program; and the main game program of 13.1K. All will run on a 16K TRS-80 with no problems, though the main game program will require Dirtop/Zap to be run first if loaded from floppy tape.

Also included are written scene settings, explanations of commands, game rules, combat and victory tables, plus unit-strength charts. All programs load without any problems. Though the rules were well set out, the game is so complex that they fail to cover every contingency, which leads to some head-scratching and ad-hoc personal rule-making.

D-Day is a long, complex game which takes a beginner six hours to play through. It lasts from June 6, 1944 until the end of that month, each game turn lasting two days. At the start the human player has to decide where the five landing beaches are to be situated, and where initially to place the units at his command — he can either land units where and when he wishes, or follow the historical timetable which is included in the documentation. Turns then alternate between player and computer. Each moves its units until they are adjacent to an opponent's unit. In this position they can choose to attack the other or not.

Attacks also involve allocating air and naval support, which are in turn affected by the weather conditions and the amount of supplies that the navy can land. The outcome of such attacks is either that both units' strengths are diminished or one unit is wiped out, which happens after a unit's stength has been considerably worn down, or a unit retreats.

Gradually, both sides' units are worn down, wiped out or forced to retreat. The German side has only a limited number of units on the screen when the invasion commences, but they are constantly being reinforced by other units arriving from the south and from Germany. Allied forces, on the other hand, are all available from the beginning, but each unit's individual strength can be reinforced overnight.

The aim of the simulation is for the Allied player to capture both Cherbourg and Caen, plus as many other towns as possible — a look-up table at various dates tells you how well you are doing.

D-Day is an extremely complex game which requires a considerable amount of understanding. Unfortunately, the battle program is so long that there does not appear to be any room left for error checking, etc. The program therefore relies on the human player's honesty; apart from preventing two units being stacked in the same location on the map, it checks nothing that the human player inputs. It is, therefore, easy to cheat, though the game's designer probably hoped that such low thoughts would never enter the head of prospective purchasers of this type of program.

Aggressive role

The computer logic is also somewhat disappointing in that it does not play a particularly aggressive role, though this may have been a conscious programming decision due to the German side's inferior manpower position. A facility to play either side would have improved the program, as the German position seems to be the more challenging one to play.

The rules themselves are complicated and at times anomalous. However, the lack of error-checking by the program allows you to modify the simulation to some extent. A shorter game can be played by assuming the Americans never entered the war.

The terrain/combat/supply rules appear to have little real effect on the outcome of the battles: they should have more obvious effects and handicap both sides more effectively than they do. Attacks themselves can be light, medium or heavy, but too often players use the latter, and overwhelming force always seems to win.

Conclusions

- D-Day is a complex game which offers the player a substantial challenge. It calls for tactical skill, planning and forward thinking which makes it very absorbing.
- The game's realism and the sense of playing against a real opponent are considerable assets.
- The simulation can be recommended to anybody interested in tactical war games. Along with other campaign games in the same series it appears to be the nearest approximation to real war-gaming simulation available for the TRS-80.
- The program appears to be bug-free.
- Ratings:

Physical quality	Fair
Perceived complexity	Good
Subject complexity	Fair
Realism	Fair
Play balance	Good
Overall	Very good

ZX81 USERS

From "BYG BYTE" comes a fully compatible, assembled, tested and guaranteed

16k RAM PACK

PLUG-IN MEMORY

Send to Name .....

Address .....

.....

.....

All cheques and postal orders made payable to

CAPS LTD

Dept D

And forward to **28 The Spain**
Petersfield, Hampshire GU32 3LA

Allow 28 days for delivery

WHY PAY MORE?

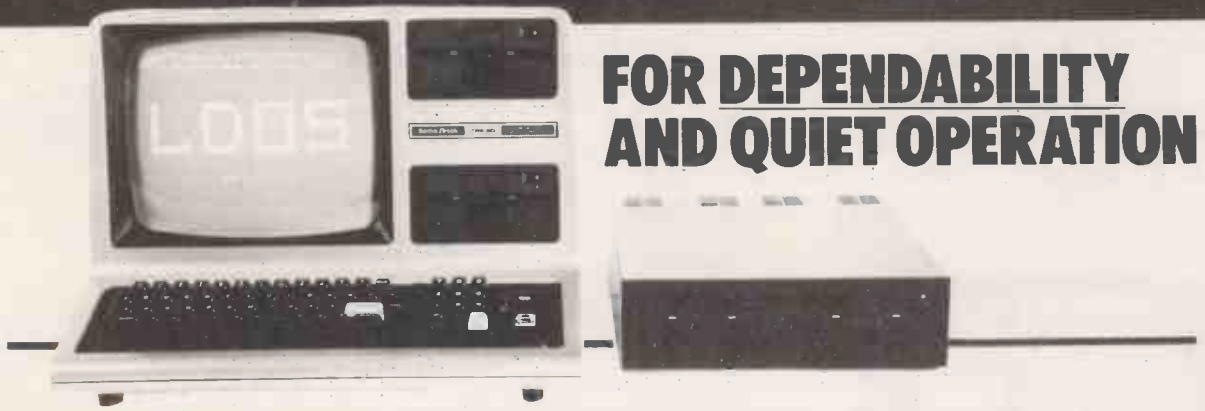
Fully inclusive price each

£34.95

● **Circle No. 263**

CUMANA

TRS 80 MODEL III DUAL DENSITY DISK DRIVES



FOR DEPENDABILITY AND QUIET OPERATION

INTERNAL DRIVE PRICES		CAPACITY
1 x 40 Track Drive	£420	184K Bytes
2 x 40 Track Drives	£599	368K Bytes
1 x 80 Track Drive	£460	368K Bytes
2 x 80 Track Drives	£695	737K Bytes
1 x 80 Track Double Sided Drive	£620	737K Bytes
2 x 80 Track Double Sided Drive	£999	1474K Bytes

Internal Drive prices include Disk Controller Board, Power Supply Unit and all Cables and Connectors required for installation.

EXTERNAL DRIVE PRICES	
1 x 40 Track Drive	£219
2 x 40 Track Drives	£399
1 x 80 Track Drive	£285
2 x 80 Track Drives	£539
EXTERNAL 2 Drive Cable	£15

External Drives are directly compatible with the TRS 80 Model I and Video Genie Expansion Interfaces.

You can depend on **Cumana**; we scour the world markets for top quality products to give you efficient, trouble free operating. Like DISKS from TEAC of Tokyo and other leading names. Cumana are alert for the latest proven developments and promise you attentive service. Write or 'phone for Data Sheets.

Call your nearest dealer for a demonstration:

RADIO SHACK LTD., 188, Broadhurst Gardens, London NW6. Tel: 01-624-7174

COMPSHOP LTD., 14, Station Road, New Barnet, Herts. Tel: 01-441-2922

COMPSHOP LTD., 311, Edgware Road, London W2. Tel: 01-262-0387

COMPSHOP LTD., 19, Herbert Street, Dublin 2. Tel: 604165

LONDON COMPUTER CENTRE, 43, Grafton Way, London W1. Tel: 01-388-5721

N.I.C., 61, Broad Lane, London N15. Tel: 01-808-0377

CROYDON COMPUTER CENTRE, 29a, Brigstock Road, Thornton Heath, Surrey. Tel: 01-689-1280

P J EQUIPMENT LTD., 3, Bridge Street, Guildford. Tel: 0483-504801

R.D.S. ELECTRICAL LTD., 157-161, Kingston Road, Portsmouth. Tel: 0705-812478

TANDY HASTINGS LTD., 48, Queens Road, Hastings. Tel: 0424-431849

MICROWARE COMPUTING SERVICES, 57, Queen Charlotte Street, Bristol. Tel: 0272-279560

BLANDFORD COMPUTERS, Higher Shaftsbury Road, Blandford Forum. Tel: 0258-53737

TAPE SHOP, 32i Viaduct Road, Brighton. Tel: 0273-609099

PARWEST LTD., 18, St. Mary Street, Chippenham. Tel: 0249-2131

COMPUTER SHACK, 14, Pittville Street, Cheltenham. Tel: 0242-584343

TANDY GLOUCESTER, 13, Clarence Street, Gloucester. Tel: 0452-31323

COMSERVE, 98, Tavistock Street, Bedford. Tel: 0234-216749

CLEARTONE COMPUTERS, Prince of Wales Ind. Estate, Abercarn, Gwent. Tel: 0495-244555

EMPRISE LTD., 58, East Street, Colchester. Tel: 0206-865926

MAGNUS MICRO-COMPUTERS, 139 The Moors, Kidlington, Oxford. Tel: 08675-6703

CAMBRIDGE COMPUTER STORE, 1, Emmanuel Street, Cambridge. Tel: 0223-65334

I.C. ELECTRONICS, Flagstones, Stede Quarter, Biddenden, Kent. Tel: 0580-291816

MICRO CHIP SHOP, 190, Lord Street, Fleetwood, Lancs. Tel: 03917-79511

HARDEN MICRO-SYSTEMS, 28-30, Back Lord Street, Blackpool. Tel: 0253-27590

AMBASSADOR BUSINESS COMPUTERS LTD., Ashley Lane Works, Shipley, W. Yorks. Tel: 0274-595941

Q-TEK SYSTEMS LTD., 2 Daltry Close, Old Town, Stevenage, Herts. Tel: 0438-65385

COMPUTER & CHIPS, Feddinch Mains House, St. Andrews, Fife, Scotland. Tel: 0334-72569

HEWART MICRO-ELECTRONICS, 95, Blakelow Road, Macclesfield. Tel: 0625-22030

KARADAWN LTD., 2 Forest Way, Great Sankey, Warrington. Tel: 0925-572668

PHOTO-ELECTRICS, 459 London Road, Sheffield. Tel: 0742 53865

ARC ELECTRONICS, 54 Heron Drive, Sandal, Nr. Wakefield, W. Yorks WF2 6SL. Tel: 0924-253145

VICTOR MORRIS LTD., 340 Argyle Street, Glasgow, G2 8LY. Tel: 041-221 8958

COMPRITE LTD., Thorite House, Laisterdyke, Bradford. Tel: 0274-663471

GNOMIC LTD., 46, Middle Street, Blackhall, Hartlepool. Tel: 0783-863871

BRIERS COMPUTER SERVICES, 1, King Edward Square, Middlesbrough, Cleveland. Tel: 0642-242017

3 LINE COMPUTING, 36, Clough Road, Hull. Tel: 0482-445496

H.C. COMPUTER SALES LTD., 182, Earlsway, Team Valley Trading Estate, Gateshead. Tel: 0632-874811

EWL COMPUTERS LTD., 8, Royal Crescent, Glasgow. Tel: 041-332-7642

EVERYMAN COMPUTING, 14 Edward Street, Westbury, Wilts. Tel: 0373-864644

CUMANA LTD 35 Walnut Tree Close, Guildford, Surrey, GU1 4UN. Telephone: (0483) 503121. Telex: 858306

Please add VAT to all prices. Delivery at cost will be advised at time of order.

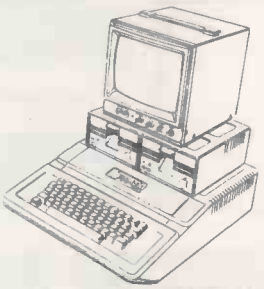
ANGLIA COMPUTER CENTRE

SPECIALISTS IN MICROCOMPUTERS FOR BUSINESS, AND SCIENCE

88 ST. BENEDICT'S STREET, NORWICH NR2 4AB.

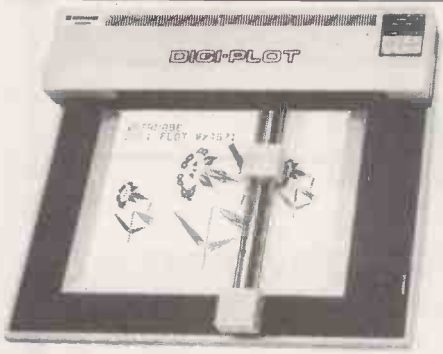
TELEPHONE: (0603) 29652

From the **LARGEST EAST ANGLIAN**
Microcomputer specialists and **APPLE II DISTRIBUTORS:**
Trade in your "PET" for something better!!!
Apple II still only £799.00 at ANGLIA plus
FREE 'Anglia Invaders' or 'Microchess' programme.



ANGLIA FOR APPLES AND MUCH MORE!!

SPECIALIST EQUIPMENT AND PROGRAMMES FOR APPLE II



No. 1 UNIQUE GRAPH PLOTTING SOFTWARE FOR THE DIGIPLOT!!!
To plot graphs created by 'Apple Plot' and 'Visicalc'

DIGIPLOT	£895.00
APPLE PLOT	£37.00
VISICALC	£111.00
DIGIPLOT SOFTWARE	£105.00

(FREE when you purchase 'Digiplot' from us)

No. 2. SOFTWARE INTERFACE BETWEEN 'GRAPHICS TABLET' AND 'DIGIPLOT' £95.00
(FREE when you purchase either 'Graphics Tablet' or 'Digiplot' from us)

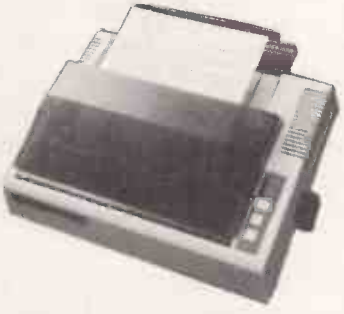
No. 3. Get the most versatile and low cost printers for your Apple II and take advantage of its versatile character set from within 'Apple Writer' by using the EPSON/APPLE WRITER ADVANCED CHARACTER GENERATOR £49.00
(FREE if you purchase an Epson Printer and Apple Writer from us)

No. 4. CASHBOOK PROGRAMME suitable for personal, departmental, societies or institutional use £95.00

No. 5. COSTING your production of ASSEMBLED PRODUCTS includes Stock Control and Price Update of individual items (written in Pascal) £650.00

No. 6. PROPERTY RENTAL — suitable for Estate Agents.

No. 7. EXAM TIME — save yourself time in preparing Multiple Choice Questions and After Exam Tuition. Suitable for schools, colleges and industry training £49.50



EPSON PRINTERS

Epson MX80 F/T	£399.00
Above with graphics	£450.00
Epson MX100	£575.00
EPSON MX130	CALL
Epson Apple Interface with cable	£60.00

APPLE III—STILL WAITING??? THEN GET IN TOUCH WITH US

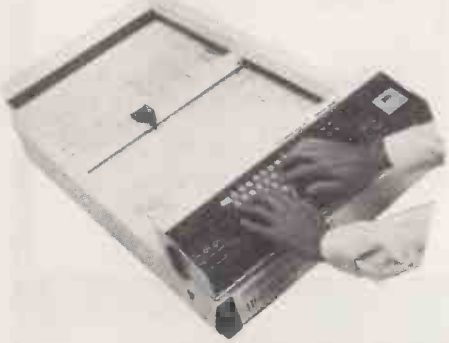
APPLE II's are hard at work ..... on **THE HARD DISK NETWORK**

SEE IT RUNNING at our showroom and save your company £1000s on Minicomputers or Mainframes

INVOICING & SALES | PURCHASES | WORD PROCESSING | FINANCIAL PLANNING | BASIC | PASCAL | COBOL | HARD DISC

Are you still trying to grasp computing with a ZX80/81? — we will trade your ZX80 OR ZX81 for something better!!!

Starting with **ACORN ATOM**
We are full stockists of all Acorn Atom products and programmes plus our own.



The **ANGLIA ATOM MONITOR** to help you into the heart of machine code computing £14.95
(FREE with every assembled Atom purchased from us **FAST DELIVERY.**
We also stock the Seikosha GP80 Printer and Atom connecting cables.

ENGINEERS! DRAUGHTSMEN! DESIGNERS! ARCHITECTS!
Enter the drawing office of the future today with this revolutionary Microcomputer-based draughting machine for as little as £1.00 per hour.

WE ALSO DISTRIBUTE: Anadex . . . Tandy TRS-80 . . . Tangerine . . . Tantel . . . North Star . . . video Genie . . . Qume . . . Paper Tiger . . . Olympia . . . Centronics . . . Starwriter . . . Sharp . . . Texas Instruments TI/99/4.
TELEPHONE: (0603) 29652. All prices quoted exclude VAT.

Note: Soon opening other branches in East Anglia and London. Sales and Technical Staff required. Interested parties please apply in writing.

NOW YOUR HP-85 IS COMPLETE

WITH THE MSC-9800H 5.0Mb WINCHESTER DRIVE

- 45ms access time.
- 22 bit error detection/11 bit error correction.
- 256 byte data buffer.
- Software compatible with HP9895 floppy drive.
- Compact desk top unit measuring 6⅜" × 10½" × 12".
- Low cost per byte.

JUST PLUG IN AND RUN!! . . . OTHER MODELS AVAILABLE.
MSC-9800 — STANDARD IEEE-48/MSC-9800 L-HP9800 SERIES COMPATIBLE. ..

U.K. DISTRIBUTORS:

ANGLIA COMPUTER CENTRE
88 ST. BENEDICTS STREET, NORWICH NR2 4AB.
TEL: (0603) 29652/26002.

AS SHOWN AT COMPEC 1981
DEALER ENQUIRIES WELCOME

Tired of hearing about PASCAL?

We think you've waited long enough.

At last, there is an easy to understand Pascal sampler to help you learn Pascal programming, LinkSampler. And to fill the needs of the Pascal programmer, two Pascal utility programs to increase your programming productivity, LinkVideo and LinkDisk.

Link Systems backs its commitment to quality Pascal software with fifteen years of mainframe and micro computer programming experience.

The Easiest Way to Learn Pascal

● **LinkSampler** is an entertaining Pascal learning tool, supplied with easy to understand documentation. LinkSampler includes a full diskette of games, math procedures and financial programs.

LinkSampler I will help you put into practice what you have read in books. **£49.95**

An Interactive Pascal Utility

● **LinkDisk** fills the needs of the programmer for manipulating individual bytes of Pascal mass storage media.

It compares, examines and changes any byte on an Apple Pascal disk and translates DOS Basic into Pascal.

Compare.

This function enables you to insure that a disk copy was performed without error, and the copy is readable. Good for Pascal and Basic.

Examine.

Enables you to examine and change data on mass storage, change data byte by byte and alter any nibble of data.

Translate.

Enables you to translate DOS 3.3 text and Binary files into Pascal. **£54.95**

A Multi Function Programmers Aid

● **LinkVideo** saves valuable Input, output programming time, and provides terminal independence for essential screen functions.

- Erase to End of line.
- Erase to End of Screen. ● Clear Screen.
- Cursor Moves (both input and output).
- Line and Screen Erasure.
- Filters, Validates and prompts input for Strings, Fields, Boolean, Social Security Numbers, Telephone Numbers, Dates, Integers, Pseudo-Reals. **£44.95**

LINK SYSTEMS

U.K DISTRIBUTORS:

ANGLIA COMPUTER CENTRE
88 ST. BENEDICTS STREET, NORWICH NR2 4AB.
TELEPHONE: (0603) 29652/26002.

(All prices exclude VAT)

DEALER ENQUIRIES WELCOME

● Circle No. 265

ESCON
INTERFACE SYSTEM

MAKES YOUR IBM GOLFBALL TYPEWRITER
INTO A TOP QUALITY
COMPUTER OUTPUT PRINTER.

Add our Escon Interface System to your IBM office golfball typewriter and it becomes a computer printer. Yet its appearance, or function as a typewriter, has not been affected. So you're doubling the usefulness of your typewriter and at the same time getting the best possible print quality from your computer. And there's a bonus for your budget, too. The Escon Interface System is inexpensive — about a third of what you'd pay for most word processing printers.

What can be better than that?

With Escon, your golfball typewriter and a word processing program for your computer, you're all set to produce error-free letters and reports that still look as if they were carefully typed and not just churned out by a computer printer.

Full compatability with most micros and minis.

RS-232C or Parallel Interface — Switch Selectable.

Does not affect eligibility for IBM warranty or service.

High reliability design — gives years of service.

For IBM Model 72, 82 and Selectric III, Sperry SR-101 — £415

For IBM Electronic Models 50, 60 and 75 — £365

DATARITE

Datarite Terminals Ltd, Caldare House,
144-146 High Road Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

● Circle No. 266

"ATTENTION COMPUTER DEALERS"

Let us be your Exporter/Purchasing Agent in the United States for the following products:—

MICROCOMPUTERS:— Ohio Scientific, Onyx.

PRINTERS:— Okidata, Centronics, NEC, Xerox/Diablo, Anadex, Printerm, Eaton.

TERMINALS:— Micro-term, Televideo, Hazeltine, Zintec, Beehive.

MAG-TAPE:— Alloy engineering cartridge and reel.

FURNITURE:— Printer Stands, CRT Stands, Computer Tables.

MISC:— Blank Floppy Disks, Blank Cartridge and reel mag tape, CRT Cables, etc.

NOTE
IF YOU DON'T SEE YOUR NEEDS, PLEASE CONTACT US WITH YOUR REQUIREMENTS.

SYSTEMS INTERNATIONAL INC
500 CHESHAM HOUSE,
150 REGENT STREET,
LONDON W1R 5FA

SYSTEMS INTERNATIONAL INC
15920 LUANNE DRIVE
GAITHERSBURG, MARYLAND
20760 U.S.A.

Telephone 301-977-0100. Telex 710-828-9703
Cable Address SYSINTL. GAITHERSBURG MD

● Circle No. 267

SINCLAIR ZX81
ZX81 built + mains adaptor £60.83 (Post £2.95 extra).

PRINTERS
Buy any of the below and get a free interface kit and word processor program for UK101 or Superboard. Seikosha GP80A £199. Centronics 737 £335. OKI Microline 80 £295. OKI Microline 82A £399. Epson MX70T £259. Epson MX80T £359. Epson MX80F/T1 £399. Epson MX80F T2 £449.

SHARP COMPUTERS
MZ80K 20K £380, 36K £394, 48K £408. PC1211 £82. 46 sample programs for £15. We can supply any Epson printer to run direct from the MZ80K without i/o box for £39 plus printer price.

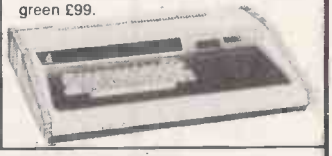
VIC 20 COMPUTER
VIC 20 £165. Cassette recorder £39.09. Kit to allow the use of a normal cassette recorder £6. 3K ram £26.04. 8K ram £39.09. 16K ram £65.17. High resolution cartridge 1211M £30.39. Vic printer £199.

5V POWER KITS
Fully stabilized 5V computer and TTL power kits. Short circuit and over-voltage protection 1. 5A £7-83, 3A £12-17, 6A. £20.

UK101 AND SUPERBOARD
UK101 with 1K and free power supply and modulator built £149. The below accessories suit both the UK101 and Superboard: Extra ram £2-70 per K. 16K memory expansion complete kit £50, built £58. 32K memory expansion kit £74, built £82. Case £27. Cassette recorder £19. Cesmon £22-50. Wemon £19-95. Assembler/Editor tape £25. Word processor program £10. Centronics interface kit £10. 610 expansion board £179. Cased minifloppy disc drive with DOS £275. Cassette recorder £19. The below suit only Superboard: Colour adaptor board built £45. Guard band kit £10. Series 1 only 30 lines x 50 characters display expansion kit £14. UK101 display expansion kit £14.

ACORN ATOM
8K rom + 2K ram Kit £120, built £150. 12K rom + 12K ram kit £168, built £198. 4K expansion rom £25. Power supply £8.87.

NEW GENIE 1 £299
EG3014 Expansion box with 16K/32K ram £199/£213. Disk drive £220. Colour board £36. Parallel printer interface £36. Monitors: EG100 white £69. OVM9PGR green £99.



SWANLEY ELECTRONICS
Dept PC, 32 Goldsel Rd, Swanley, Kent BR8 8EZ
Tel: Swanley (0322) 64851

Postage £3-50 on computers, £4-50 on printers and 45p on other orders.
Lists 27p post free. Please add VAT to all prices.
Official credit orders welcome.

● Circle No. 268

Wherever you are in the UK there's a Genie dealer nearby

Genie I & II Approved Dealers

AVON Microstyle, Bath, 0225 334659/319705. **BEDFORD** Comserve, Bedford, 0234 216749. **BERKSHIRE** P.C.P., Reading, 0734 589249. **BIRMINGHAM** Ward Electronics, Birmingham, 021 554 0708. Consultant Electronics, Birmingham, 021 382 7247. A. E. Chapman and Co., Cradeley Heath, 0384 66497/8. **BUCKINGHAMSHIRE** Photo Acoustics, Newport Pagnell, 0908 610625. **CAMBRIDGESHIRE** Cambridge Micro Computers, Cambridge, 0223 314666. **CHESHIRE** Hewart Electronics, Macclesfield, 0625 22030. Mid Shires Computer Centre, Crewe, 0270 211086. **CUMBRIA** Kendal Computer Centre, Kendal, 0539 22559. **DORSET** Blandford Computers, Blandford Forum, 0258 53737. Parkstone Electrics, Poole, 0202 746555. **ESSEX** Emprise, Colchester, 0206 865926. **GLOUCESTERSHIRE** Computer Shack, Cheltenham, 0242 584343. **HERTFORDSHIRE** Photo Acoustics, Watford, 0923 40698. Q Tek Systems, Stevenage, 0438 65385. **KENT** Swanley Electronics, Swanley, 0322 64851. **LANCASHIRE** Harden Microsystems, Blackpool, 0253 27590. Sound Service, Burnley, 0282 38481. Computercat, Leigh, 0942 605730. **LEICESTERSHIRE** Kram Electronics, Leicester, 0533 27556. **LONDON** City Microsystems, EC2, 01 588 7272/4. Wason Microchip, N18, 01 807 1757/2230. **NORTH EAST** Briers Computer Services, Middlesbrough, 0642 242017. General Northern Microcomputers, Hartelepool, 0783 863871. HCCS Associates, Gateshead, 0632 821924. **NOTTINGHAMSHIRE** Midland Microcomputers, Nottingham, 0602 298281. Mansfield Computers, Mansfield, 0623 31202. East Midland Computer Services, Arnold, 0602 267079. Electronic Servicing Co., Lenton, 0602 783938. **NORFOLK** Anglia Computer Centre, Norwich, 0603 29652. Bennetts, Dereham, 0362 2488/9. **OXFORDSHIRE** Micro Business Systems, Whitney, 0993 73145. **SCOTLAND** Computer and Chips, St Andrews, 0334 72569. Scotbyte Computers, Edinburgh, 031 343 1005. Victor Morris and Co., Glasgow, 041 221 8958. **SHROPSHIRE** Tarrant Electronics, Newport, 0952 814275. **SOUTH WEST** West Devon Electronics, Yelverton, 082 285 3434. Bits and Bytes, Barnstaple, 0271 72789. **SUFFOLK** Elgelec Ltd., Ipswich, 0473 711164. **SURREY** Croydon Computer Centre, Thornton Heath, 01 689 1280. **WALES** Tryfan Computers, Bangor, 0248 52042. **WEST MIDLANDS** Allen TV Services, Stoke on Trent, 0782 616929. **WILTSHIRE** Everyman Computers, Westbury, 0373 823764. **YORKSHIRE** Advance TV Services, Bradford, 0274 585333. Huddersfield Computer Centre, Huddersfield, 0484 20774. Comprite, Bradford, 0274 668890. Superior Systems Ltd., Sheffield, 0742 755005. Photo Electrics, Sheffield, 0742 53865. **NORTHERN IRELAND** Business Electronic Equipment, Belfast, 0232 46161.

Sole Importers:

LOWE electronics

Chesterfield Road, Matlock, Derbyshire DE4 5LE.
Telephone: 0629 4995. Telex: 377482 Lowlec G.

● **Circle No. 269**

Small businesses come in all sizes. So do SD Systems!

The long and short of it is that no two small businesses are the same size. A fact that many small business systems seem to forget.

SD Systems appreciate the much varied requirements of 'small business' and have produced a series of microcomputers that totally adapt to your particular needs. And to help your business grow, each system will upgrade, simply and economically, as you demand more of it.

SD200	2 Mb floppy disk storage
SD610	10 Mb Winchester storage
SD700	32/96 Mb hard disk storage

All systems can be single or multi-user (1-5), require no special operating skills and are capable of running two printers at the same time.

We deliver. FAST.
Our own engineers will install free-of-charge. And unlike most systems, we offer a full twelve month warranty.

Programs for a better business.
A wide range of tried and tested business programs are available.

Including:-
★ DMS ★ General Accounting ★ Payroll ★ Word Processing ★ Stock Control ★ Client Billing ★ The Circle Package for Practising Accountants ★

To find out which system is best suited to your business, clip this coupon to your company letterhead and return it to us. No stamp required. **Dealer enquiries welcome.**

It's the painless way to grow

SDSystems

ALL SYSTEMS ARE GO FOR SMALL BUSINESS.

CIRCLE COMPUTER BUSINESS SYSTEMS

Freepost, 6 Manor Way, Old Woking, Surrey.
Telephone: Woking (04862) 21012

Name _____

Position _____

● Circle No. 270

KAI

PROFESSIONALS IN APPLICATIONS

FOR

★ **ACCOUNTING, INVOICING & STOCK CONTROL**
★ **FINANCIAL MODELLING AND PLANNING.**
★ **WORD PROCESSING AND MAILING.**
★ **PROJECT CONTROL & COSTING.**
★ **DATABASE & TAILORED SOFTWARE.**
★ **APPLE AND CP/M.**
★ **SINGLE AND MULTI USER.**
★ **UK AND INTERNATIONAL EXPORTS.**

KOMPUTATION AUTOMATION INFORMATION LTD
203A Belsize Road, London NW6

01 328 7038 **01 328 3968**

24 hour personal answering service 01 486 4808

apple computer

PLUS OTHER GOOD MICROS

● Circle No. 271

CAN YOUR COMPUTER READ THIS?

5 000201 460790

Light-pen and signal conditioning unit enable your computer to read all types of bar code. Typical applications include data collection, ticket identification systems, security checkpoint verification, stock control, identifying assemblies in service, repair or manufacturing environments, programming computers and intelligent instruments, matching of patient and transfusion blood, retail product price information at checkouts etc. Various interface options available for all computers.

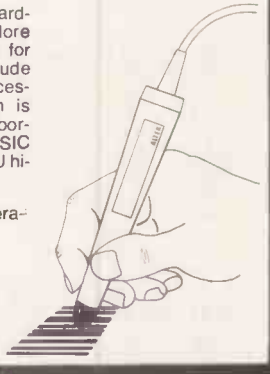
Hardware from £125 + VAT .....Further details on request

★★★★★Freelance assembler programmers needed to provide customer backup for the above product. Phone during office hours.

Professional quality light pens for use with VDUs, graphics terminals etc. Stainless steel construction, glass lens optics, built in buffer amp and touch sense switch.

£50 + VAT .....Data sheet available

'FAST DATA' light pen system (complete hardware/software package) for .Commodore PETs. This is a quality product designed for serious use. Typical applications include Computer Aided Design (CAD), wordprocessing, data selection etc. When the pen is pointed at the screen its high resolution coordinates are automatically returned as BASIC variables. Compatible with Supersoft & MTU hi-res boards.



Complete system £149 + VAT . . . Full literature available.

ALTEK (PC) 1 Green Lane
Walton-on-Thames, Surrey

Phone (093 22) 44110 — 24 hours
Access . . . Visa . . . Callers by appointment

● Circle No. 272

NOW FOR PET

See the Future Today with *MICROMODELLER*

MicroModeller is the widely acclaimed software package that allows even the smallest businesses to plan for the future.

Why plan ? "Planning is about altering the odds in favour of success", says Robert Heller, Editor of *Management Today* in his book, 'The Business of Winning'. "Fortune favours the prepared mind and the prepared company - better decisions flow continuously from better preparation."

MicroModeller has been widely acclaimed because it dramatically reduces the cost of using a computer for financial planning, preparation of budgets, production of management reports, and multi-level consolidations, by taking full advantage of the latest micro computer technology. *The **MicroModeller** program, together with the Apple II or PET computer is a complete alternative to costly time-sharing services.* Far more flexible than in-house data processing services,***MicroModeller*** puts the manager in full control for the first time.

MicroModeller is used by management for a wide variety of applications, including:

* Cash Flow Forecasting
* Budgetting
* Short-Term Planning
* Merger & Acquisition Analysis
* Computer Graphics
* Investment Analysis
* Strategic Planning
* Consolidations
* Currency Conversions
* Computer Slides

Yet the *MicroModeller* Financial Planning program for the Pet, Apple or Sirius I costs just £595 plus VAT.

A complete PET or Apple system including printer starts at around £3,000

Please ask for brochures on the latest packages from Personal Software, originators of Visicalc.

apple

To **ACT Microsoft Ltd.**, Shenstone House, Dudley Road, Halesowen, West Midlands. Tel.021 501 2284

*Please rush me details of **MicroModeller***

Name.....

Address.....

..... *Tel*..... PC 3/82

I do/do not already own an Apple/PET ACT
I do/do not have experience of Financial modelling

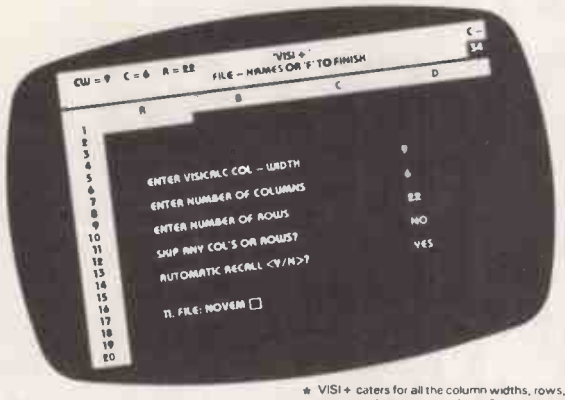
● **Circle No. 273**

NEW

VISI+

£19-75 +VAT

THE CONSOLIDATION PROGRAM FOR VISICALC™



If you are using Visicalc™ then you will probably need to consolidate your electronic sheets quite frequently, that is to say, you need to add the results of 4 weekly reports to know the monthly total, or add 3 months for the quarter, 12 months for the total year etc.
Up to now this involved keying in again all the individual sub-totals etc. of all the sheets to be added up – often taking as much time as calculating those in the first place!
Visi+ eliminates all this extra work, giving you consolidations in seconds or at most minutes – and it does it virtually without supervision.

- VISI+ is menu driven, if you can use Visicalc™ then you can use VISI+
- VISI+ can consolidate (add to each other) any number of Visicalc™ files.
- VISI+ lets you add files in a manual mode, where you enter the particular file names individually, say 2 or 3 files.
- VISI+ can consolidate automatically, where you may enter a large number of file names at the start, which VISI+ will then recall and add up one after the other. It will even prompt you to change disks if the files are on more than one data diskette.
- VISI+ caters for all the column widths, rows, and columns of Visicalc, e.g. 64 by 254, with a column width of 3 to 27.
- VISI+ gives you the option to skip any one or more columns or rows, that is it will not add these up.
- VISI+ can consolidate half a dozen Visicalc™ sheets of a matrix size 3 columns by 20 rows in approximately 60 seconds and takes only 1 minute each to add sheets of 12 columns by 40 rows – saving hours of manual calculation and keying effort.
- VISI+ can handle any matrix size which you are able to save with Viscalc.™ For very large consolidations, say 52 sheets of a size 24 columns by 50 rows, you may speed up the process by using a RAMEX card and the 'Manager' DOS relocater.

Please specify DOS 3·2 or 3·3

VISCALC IS THE TRADEMARK OF PERSONAL SOFTWARE INC.

See your local dealer, or order direct
Access or Visa accepted.
Add £1.50 P & P. VAT excluded.

VERGECOURT LTD

DDP RESEARCH & MARKETING

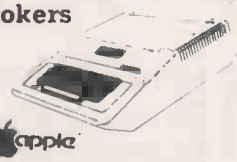
Reg Office: 17 Nobel Square,
Basildon, Essex SS13 1LP.
Telephone: 0268 728484.
Telex: 995323

● Circle No. 274

Businessmen and professional people alike can rid themselves of day–to–day problems and increased workload with a microcomputer.

- **Accountants**
- **Estate Agents**
- **Retailers**
- **Insurance Brokers**
- **Doctors**
- **Dentists**
- **Solicitors**
- **Architects**
- **Engineers**
- **Chemists**
- **Farmers**
- **Bankers**
- **Teachers**

to name but a few



apple

SUPER BRAIN™

Just a few tasks a microcomputer could be organising for your company, division or department:–

RAIR

commodore

SHARP

- **Integrated Accounts** ●
- **Sales Ledger** ●
- **Purchase Ledger** ●
- **Nominal Ledger** ●
- **Sales Forecasting** ●
- **Stock Control** ●
- **Job Costing** ●
- **Estimating** ●
- **Payroll** ●
- **Word Processing** ●

(automatic compilation, editing and production of repetitive letters and documents).

Johnson microcomputers

A member of the T. V. Johnson Group

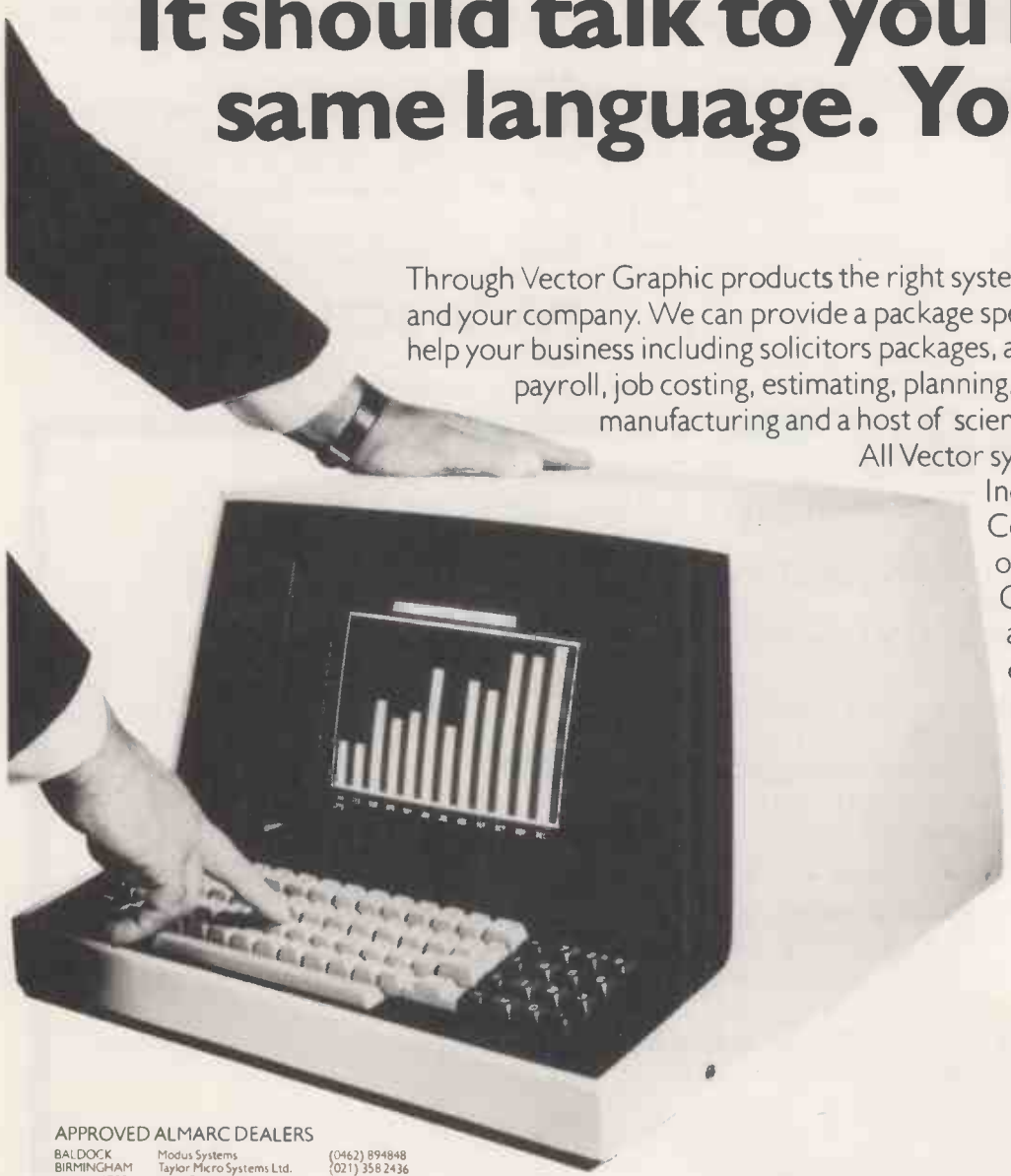
CRA

Johnson House, 75-79 Park Street,
Camberley Surrey. Telephone 0276 20446
48 Gloucester Road. Bristol. Telephone 0272 422061
148 Cowley Road, Oxford. Telephone 0865 721461

● Circle No. 275

Plain talk.

You should be able to talk to your computer in simple, everyday language. It should talk to you in the same language. Yours.



Through Vector Graphic products the right system can be found for you and your company. We can provide a package specifically designed to help your business including solicitors packages, accounts, stock control, payroll, job costing, estimating, planning, printers job costing, manufacturing and a host of scientific and technical systems.

All Vector systems are based on the Industry Standard S-100 Bus Configuration and CP/M operating system.

Give Almarc a ring today and we'll arrange a demonstration. It couldn't be simpler than that.

APPROVED ALMARC DEALERS

BALDOCK	Modus Systems	(0462) 894848
BIRMINGHAM	Taylor Micro Systems Ltd.	(021) 358 2436
DONCASTER	Reed Computing	(0709) 67087
HIGH WYCOMBE	Common Sense Business Systems	(0494) 40116
HARROGATE	Business Microsystems	(0423) 68224
KETTERING	Shuttleworth Business Systems	(0536) 511357
LEEDS	A. C. Barratts	(0532) 456944
LONDON	Micro Systems Consultants	(01) 979 4098
LOUTH	Computa-Crop	(0507) 604271/2
MACCLESFIELD	Resolux Ltd.	(0625) 28220
NOTTINGHAM	Bestmoor Limited	(0602) 415315
SWANSEA	Business Microsystems	(0792) 474082
TYNE & WEAR	H.P. Micros	(0632) 859923
YEOVIL	Dale Computers	(0935) 72000

Almarc Data Systems Limited,
Great Freeman Street,
Nottingham NG3 1FR. Tel: (0602) 52657.
Telex: 37407 Almarc/G.

Also at: Green Street, High Wycombe,
Bucks. HP11 2RF. Tel: (0494) 23804.

Almarc
DATA SYSTEMS

● **Circle No. 276**

Have you bought a ZX81? Now here's a cassette recorder to match it!

The ECR81 Enhanced Certified Recorder from MONOLITH is a major advancement in cassette recorder technology which minimises the problems associated with standard audio recorders. This is a high quality proven cassette mechanism, enhanced to provide just the right signal levels to ensure reliable read and write data transfer between the magnetic tape and your ZX81.

- Each ECR81 comes complete with its own individual certification tape, tested and serial numbered to prove your machine reliability.
- Signal enhancement circuit board with phase - locked - loop control and signal shaping for peak performance.

£47.50
Including VAT.
complete

- A long life head is fitted, matched to TDK CrO2 high bias, super avilyn|cassette tapes.
- Mains & DIN connector leads provided.
- Certification of tape head alignment - height and azimuth.
- Certified tape tension, torque and speed.
- Fast forward and rewind tape search controls.

The ECR81 is also suitable for Sinclair ZX80

To: MONOLITH ELECTRONICS CO. LTD., 5/7 CHURCH STREET, CREWKERNE, SOMERSET

Please supply me with:	Price	Total
..... (Qty.) Monolith ECR 81 Enhanced Certified Recorder(s) to be used with my ZX81	£47.50 (Each)	
I also enclose postage & packing per recorder	£2.50	
	Prices include VAT £	

Please print

Name: Mr/Mrs/Miss.

Address

- Please allow up to 28 days delivery. ● The ECR81 is backed by our 14 day money-back option. ● The ECR81 is not suitable for audio reproduction.

MONOLITH
electronic products
Telephone: Crewkerne 0460 74321

MICRO-80 UK Subscription Dept.

24 Woodhill Park Pembury Tunbridge Wells Kent TN2 4NW

WE ARE PLEASED TO ANNOUNCE that MICRO-80 is now available in the UK in CASSETTE EDITION.
Each month we publish at least six programs for the TRS-80 or VIDEO GENIE and . . .
SUBSCRIBERS may now have the benefit of receiving their programs on cassette for IMMEDIATE LOADING.
WE ARE ALSO CONTINUING our special offer of a FREE cassette program to all new subscribers who complete the coupon below — even if you order a subscription to the magazine only.

Please enrol me for an annual subscription and send me my FREE cassette program.
I enclose £16.00 ☐ (magazine only) or £43.60 ☐ (magazine and cassette edition).
(enclose your cheque/P.O. made payable to MICRO-80 and send to the above address)
Software offer, and cassette edition prices applies to U.K. residents only. Overseas subscription rates on application.

Name .....
BLOCK CAPITALS PLEASE

Address .....

.....

PC 3/82

sirton computer systems

THE SPECIALISTS IN S100 SYSTEMS

MIDAS S100 SYSTEMS

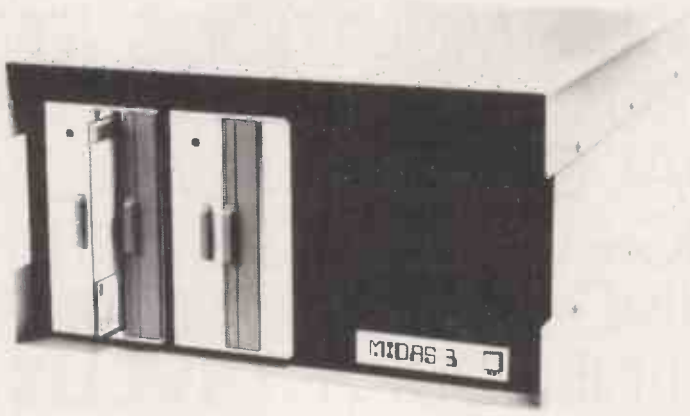
MIDAS 1: From £835

MIDAS 2: From £1,790

MIDAS 3: From £2,450

MIDAS 3HD: From £5,495

ITHACA-DPS 1: From £1,494



- Our versatile **Z80** Microcomputers are available as standard units or custom configured to your exact specification from a comprehensive range of stocked **S100** boards.
- Disc storage capacity of the **MIDAS 3** can be 2M Bytes, expandable to over 80M Bytes with a Winchester Hard Disc Unit in our **MIDAS 3HD** range.
- **MIDAS** runs **CP/M** and MP/M. Other Software includes M-BASIC, C-BASIC, FORTRAN, COBOL, CIS-COBOL, PASCAL and Word Processing.
- A **MIDAS 3D** with 64K RAM and 2M Bytes storage on two 8" drives with two Serial I/O Ports and CP/M only **£2,965**.
- Printers, VDUs and other peripherals stocked to give complete package system at keen prices.

BOARDS

We stock over 50 different S100 Boards all from quality manufacturers, such as Godbout, SSM, Micromation, Dual, Ithaca, Vector, S.D. Systems, Morrow, Pickles & Trout, etc.

PROCESSOR

Z80 Starter Kit	£251
SBC 100	£215
8085/88 CPU	£190
Z80A CPU 4MHz (4 Types)	From £157
8086	(tba)

EPROM

2716 EPROM (2 x 16K)	£95
2768/2716/2732 Programmer	From £143

VIDEO BOARDS

24 x 80 I/O Drive	£240
24 x 80 Memory Mapped	£240

DISK CONTROLLERS

Single Density 5" or 8"	From £150
Disc 1 D/D DMA	£282
Double D/D + Serial I/O	£336

RAM

Static RAM 16-64K 24 Bit add.	From £175
Dynamic RAM 64K 8/16 Bit	£683
Memory Manager	£60

I/O BOARDS

2s/2p or 4s/2p or 3p/1s etc	From £120
A/D & D/A 8 or 12 Bit	From £220
IEE 488 interface	£360

MISCELLANEOUS

Real Time Clocks (2 Types)	From £120
Graphics 256 & 512 x 256	£280
Maths Board AMD 9511	£345
Extender Boards/Logic Probe	£45
Mother Boards 8-20 Way	From £32

MAINFRAMES

We are the sole UK Distributor for Integrand Mainframes and Disc Enclosures, available in nine models including Desk Top and Rack Mounting, with or without provision for Disc Drives. All units totally enclosed, painted on all external surfaces and complete with power supply etc.

SOFTWARE

CP/M 1 & 2, MP/M, PL/1, C-BASIC 2, M-BASIC V5, XYBASIC, FORTRAN 80, COBOL 80, CIS-COBOL, PASCAL/Z, PASCAL M/T, Forth, MAC, ZSID, Disassembler, Wordstar, Datastar, Magic Wand, Wordmaster, Supersoft etc etc.

Prices exclusive of VAT

We are pleased to discuss your requirements and will advise you as to whether your needs can be met with one of our computers.

All of our systems are specials as they are configured to suit your specification, thus ensuring that you get what you want rather than what happens to be available.

Write or phone for a catalogue.

Unit 14, 29 Willow Lane, Mitcham, Surrey
Telephone: 01-640 6931/2/3

sirton computer systems

● Circle No. 278

IF ANY OF THE FOLLOWING WORDS GIVE YOU A BUZZ . . . ANALYSIS STATISTICS DE SIGN PLOTTING GRAPHICS REPORT WRIT ING SPECIFICATIONS SCHEDULES COSTING PLANT MAINTENANCE PRODUCTION CON TROL SIMULATIONS IEEE INTERFACING IN STRUMENT CONTROL MONITORING TERM INAL COMMUNICATIONS PAPERTAPE READ ING PUNCHING & EDITING SELF PROGRAM MING BASIC ASSEMBLER LANGUAGE MA CHINECODE . . . GIVE US A BUZZ (OR SEND BACK THE COUPON)

The micro comes of age. The PET has come a long way since micros were regarded as toys. It's designed and built for demanding work and this shows in the 32K memory and 80 column screen as well as in its impressive disk capacity. When it comes to languages, you'll find the PET fluent in BASIC, PASCAL, FORTH, COMAL, LISP, PILOT, FORTRAN, APL and ASSEMBLER.

It can be used as a complete system in itself, or can be linked to other PETs or a mainframe.

Who needs PET? And why? The list above speaks for itself, but that's only part of the story as the PET now has over 600 applications. It's good news for any engineer who's tried to get even a modest budget approved – the PET is very acceptable to the most sceptical of money people.

It's an attractive proposition, too, to DP professionals who need their fingers on the pulse and are fed up with waiting for their turn on the company computer.

In fact, it's the nearest thing to the all-purpose computer for everyone. An extravagent claim? A demonstration can prove it to be true.

The PET has track record. We've been involved with electronics for over 20 years and there are now over 30,000 PET installations in the UK. We manufacture our own microchip which is happily accepted and used by makers of other well-known microcomputers.

You get nationwide dealer back-up with Commodore. What's more, many of our dealers have specific expertise – which means they can advise on anything from business systems to specialist technical applications. So, if your particular problem is of a highly specialised nature, it may be best to contact our Information Department direct. They will then recommend the dealers who understand – and who speak your kind of language.

What does all this cost? Not a lot. In fact, our computers start at £200 and go through to £8,000 – which will buy you a business system. That's just one more reason why any professional worth his salt would be interested in a microcomputer that's made its name in the business world . . . but is far more than just an efficient business brain.

Send to: Commodore Information Services, P.O. Box 109, Baker Street, High Wycombe.
Tel: Slough 79292.
I'd like to know how a Commodore PET could give me a buzz.

Name .....

Company .....

Address .....

Tel: .....

Key No. 12 PRI

COMMODORE PET
Quite simply, you benefit from our experience

● Circle No. 279

Commodore Official Dealer List

LONDON
Adda W13
01-579 5845
Capital Computer Systems W1
01-636 3863
Logic Computer Systems SW1
01-222 1122/5492
Merchant Systems Ltd EC4
01-583 6774
Micro Computation N14
01-882 5104
Microcomputer Centre SW14
01-878 7044/7
Sumlock Bondain Ltd EC1
01-250 0505
Informex-London Ltd SE13
01-318 4213/7
CSS (Systems) Ltd E8
01-254 9293
Meares Consultants Ltd NW3
01-431 3410
Data Base NW2
01-450 1388

SURREY & MIDDLESEX
Douglas Moore Ltd Kingston-Upon-Thames
01-549 2121
Micro Facilities Ltd Hampton Hill
01-979 4546/941 1197
PPM Ltd Woking
04867-80111
Dataiect Computers Ltd Croydon
01-680 3581
Dataiect Computers Ltd Woking
04862-25995
Johnson Microcomputers Camberley
0276-20446
Wego Computers Ltd Caterham
0883-49235
Cream Computer Shop Harrow
01-863 0833
Da Vinci Computer Shop Edgware
01-952 0526
L & J Computers Stanmore
01-204 7525/206 0440

KENT, SUSSEX & HAMPSHIRE
Amplicon Micro Systems Brighton
0273-562163/608331
Business Electronics Southampton
0703-738248
HSV (Microcomputers) Ltd Hants
0256-62444/0703-331422
Millhouse Designs Ltd Alton
042-084517
The Computer Room Tonbridge
0732-355962
Scan Computers Storrington
09066-5432

ESSEX
Dataview Colchester
0206-865835
CSSC Ltd Ilford
01-554 3344
DDM Brentwood
0277-229379
Stuart R Dean Ltd Southend-on-Sea
0702-62707

BERKSHIRE, BUCKINGHAMSHIRE, OXFORDSHIRE & WILTSHIRE
Commonsense Business Systems Ltd High Wycombe
0494-40116
Orchard Computer Services Wallingford
0491-35529
Wymark Micro-Computer Centre Salisbury
04254-77012
Alphascan Ltd Banbury
029575-8202
J R Ward Computers Ltd Milton Keynes
0908-562850
The Computer Shop Oxford
0865-722872
Kingsley Computers High Wycombe
0494-449749

HERTFORDSHIRE & BEDFORDSHIRE
Alpha Business Systems Ware
0920-68926
Bromwall Data Services Old Hatfield
07072-60980/63295
Computer Plus Watford
0923-33927
HB Computers (Luton) Ltd Luton
0582-454466
Photo Acoustics Watford
0923-40698/32006
MMS Ltd Bedford
0234-40601
Brent Computer Systems Rickmansworth
87-71306/70329

EAST MIDLANDS, SOUTH HUMBERSIDE & DERBYSHIRE
Davidson Richards Ltd Derby
0332-366803/4
Roger Clark (Business Systems) Ltd Leicester
0533-20455
Arden Data Processing Leicester
0533-22255
Betos Systems Ltd Nottingham
0602-48108
Caddis Computer Systems Ltd Hinckley
0455-613544

EAST ANGLIA, LINCOLNSHIRE & NORTHAMPTONSHIRE
Arden Data Processing Peterborough
0733-47767
HB Computers Ltd Kettering
0536-520910
Sumlock Bondain Ltd Norwich
0603-26259/614302
Dataview Norwich
0603-616221

WEST MIDLANDS, STAFFORDSHIRE & WARWICKSHIRE
Joseph Ware Associates Birmingham
021-643 8033
Camden Electronics Ltd Birmingham
021-773 8240
Micro Associates Birmingham
021-328 4574
Taylor Wilson Systems Dorridge, Solihull
05645-6192
Walters Computer Systems Ltd Stourbridge
03843-70811

CBS Consultants Ltd Birmingham
021-772 8181
Peach Data Services Burton-on-Trent
0283-44968
Computer Services Midlands Ltd Birmingham
021-382 4171
Business Equipment Rentals Ltd Rugby
0788-65756
Business Equipment Rentals Ltd Coventry
0203-20246

NORTH WALES, CHESHIRE & MERSEYSIDE
Rockliff Micro Computers Mold
0352-59629
North Wales Computer Services Colwyn Bay
0492-33151
Office & Business Equipment (Chester) Ltd Queensferry
0244-816803
Catlands Information Systems Wilmslow
0625-527166
Rockliff Micro Computers Liverpool
051-521 5830

MANCHESTER
Cytek (UK) Ltd Old Trafford
061-872 4682
Executive Reprographic Manchester
061-228 1637
Sumlock (Manchester) Ltd Manchester
061-834 4233
D Kipping Salford
061-834 6367/9
Computastore Ltd Manchester
061-832 4761

LANCASHIRE
Preston Computer Centre Preston
0772-57684
Thamstern Ltd Burnley
0282-813299

YORKSHIRE & HUMBERSIDE
Ackroyd Typewriter Co Ltd Bradford
0274-31835
Alcor Computer Systems Ltd Huddersfield
0484-512352
Deans Computer Services Leeds
0532-452966
Holbrook Business Systems Sheffield
0742-484466
Holdene Ltd Leeds
0532-459459
Microware Computers Hull
0482-562107
Mitre Finch Fishergate
0904-52995
Yorkshire Electronics Morley
0532-522181
Computer Centre (Sheffield) Ltd Sheffield
0742-53519/588731
Microprocessor Services Hull
0482-23146
Ram Computer Services Ltd Bradford
0274-391166

NORTH EAST
Currie & Maughan Gateshead
0632-774540
Dysons Instruments Houghton-Le-Spring
0783-260452
Intex Datalog Ltd Eaglescliffe
0642-781193
Key Computer Services Ltd Jesmond
0632-815157

AVON, WALES & WEST COUNTRY
Calculator Services & Sales (Bristol) Ltd Bristol
0272-779452/3
Computer Supplies (Swansea) Sketty
0792-290047
McDowell Knaggs & Associates Worcester
0905-28466
Somerset Business Computers Taunton
0823-52149
Milequip Ltd Gloucester
0452-411010
Reeves Computers Ltd Carmarthen
0267-32441/2
Welsh Computer Centre Bridgend
0656-2757
Sigma Systems Ltd Cardiff
0222-21515/34869
Reeves Computers Newport
0633-212331/2
Computer Shack Ltd Cheltenham
0242-584343
Midland Micro Stourport-on-Severn
02993-77098/6706
Sumlock Tabdown Ltd Bristol
0272-27668516
Radan Computational Ltd Bath
0225-318483

DEVON & CORNWALL
AC Systems Exeter
0392-71718
Devon Computers Paignton
0803-526303
Jeffrey Martin Computer Services Ltd Truro
0872-71626
AC Systems Plymouth
0752-260861
JAD Integrated Services (Plymouth) Ltd Plymouth
0752-662616/29038

SCOTLAND
Ayrshire Office Services Ltd Kilmarnock
0563-24255/20551
Holdene Microsystems Ltd Edinburgh
031-557 4060
Robox Office Equipment Ltd Glasgow
041-221 8413/4
Gate Microsystems Ltd Dundee
0382-28194
Gate Microsystems Ltd Glasgow
041-221 9372
Mac Micro Ltd Inverness
0463-712774

EIRE & NORTHERN IRELAND
Northern Ireland Computer Centre Co. Down
02317-6548/9
Crowley Computers Ltd Dublin 2
0001-600681

ISLE OF MAN
Resource Planning Ltd Douglas
0624-4247/8

FREE PRINTER

SPECIAL MAIL ORDER OFFER

EPSON MX 80T printer (RRP £360) or OKI Microline 80 Included *FREE* when you buy the following Apple System:

APPLE II EUROPLUS 48K	£812
DISK DRIVE WITH CONTROLLER	£397
DISK DRIVE WITHOUT CONTROLLER	£311
12" GREEN MONITOR (HIGH QUALITY) & CABLE	£174
PRINTER INTERFACE CARD	£85
LIBRARY CASE OF (10) CDC s/s d/d DISKS	£20
EPSON MX 80T or OKI MICROLINE 80	FREE
TOTAL (excluding VAT):	£1,799

* NO HIDDEN EXTRAS — FREE DELIVERY mainland UK.
* INCLUDES 1 YEAR WARRANTY PARTS & LABOUR

If you prefer an alternative printer or any variation on above system, please contact us for an unbeatable offer.

BUSINESS APPLICATION SOFTWARE

VISICALC 3.3	£99
VISIDEX	£99
VISITREND/VISIPLOT	£139
VISITERM	£79
VISIPLOT	£75

*** VISIFILE *** It's here at last! **New database from Personal Software. File Management on the Apple for only £150. Includes record filing, searching, sorting, prints reports and mailing labels. Fast, simple, automatic — numerous applications.**

MAGIC WINDOW Word Processing System no extra requirements	£75
MAGIC MAILER (combines with above)	£45
High Tech INFORMATION MASTER	£79
Stoneware DB MASTER	£130
BRAIN SURGEON fault diagnostic disk	£30
DISK RECOVERY PROGRAM	£24
PROGRAM LINE EDITOR programming aid	£24

BUSINESS SYSTEMS AND SERVICES

FULLY INTEGRATED PASCAL ACCOUNTING PACKAGES BY SYSTEMATICS
Sales, Purchase and Nominal Ledgers
Invoicing, Stock Control & Payroll.

TIME COST LEDGER SYSTEM — time recording system written by ourselves for an accountancy practice in Manchester. (Dealer enquiries welcome.)

Systems installed by trained engineers. On-site training available for your staff. Maintenance contracts available on-site

INTERFACE CARDS

VIDEX 80 COLUMN CARD	£185
16K RAM CARD	£99
APPLE LANGUAGE CARD	£99
MOUNTAIN CPS MULTIFUNCTION CARD All-in-one bi-direction serial i/face parallel port, clock/calendar card	£120
Printer interface card & cable (Hi Res)	£75

PRINTERS

Epson MX80F/T New Type 2 (Hi Res Graphics)	£399
Epson MX100 (Hi Res Graphics)	£525
Epson MX82 (Hi Res Graphics)	£399

Other EPSON & OKI Printers write or call for best prices.
GAMES GALORE — BEST PRICES

Apple approved Level 1 Service Centre 1 year warranty on Apple products and Epson printers.

Add 15% VAT — Post & packing FREE mainland UK. Write or phone for further details.

apple® computer
SALES AND SERVICE

M
C C

MICRO COMPUTER CONSULTANTS LTD.
ASCOTT HOUSE, 227 ELLIOTT ST., TYLDESLEY, GREATER MANCHESTER
Tel: Atherton (0942) 892818, 0942-87 6141
Evening, Weekend Tel: 061-707 2689

● Circle No. 280

COMPUTER PLUS
WATFORD

A smart new computer store with a very wide range of products. Staff experienced in computers and in business systems are available to discuss your requirements — for a stock-control system, a word-processor, a file-retrieval system, a home computer — or just a book. Among the systems on display:

COMMODORE — as full commercial systems dealers for CBM, we handle the 4000 and 8000 series machines — with a vast range of business, scientific & engineering software. We have the VIC-20, too.

SHARP — MZ-80K (at a special low price) and the super new MZ-80B, with CP/M, high res. graphics, etc. The PC1211 pocket computer is also in stock.

ACORN — the amazing Atom — over 20,000 installed — the ideal first computer for the home. Ring to hear about our low prices.

TEXAS — the new TI-99/4A home computer, faster, new keyboard, 16 colours, 5 octaves music, over 400 software modules.

We also have a wide range of software, computer books and supplies. We're situated in the Queen's Road, opposite Trewins department store — and we're near the car-parks!

COMPUTER PLUS
47 Queens Rd., Watford, Herts WD1 2LH
Telephone 0923 33927

● Circle No. 281

Introducing

The T.C.S. SIMPLE filing system
© Microconcepts Inc.

for all CP/M computers

IMAGINE WRITING PROGRAMS IN PLAIN ENGLISH

which will:

- **Define files, and input data to them**
- **Produce reports on printer, or screen in any sequence you want**
- **Select records according to field values**
- **Add, or change, indexes to existing files**
- **Produce a single-level total of any field**
- **Give password protection**

SIMPLE WILL DO ALL THIS FOR YOU, AND MORE. PRICE £115 incl. manual (manual only £20).

Available only from U.K. Distributors:

MICRO'S MEAN BUSINESS LTD.,
58 New House Lane,
Canterbury, Kent.
Tel: (0227) 61580.

● Circle No. 282

SENSIBLE SOFTWARE SPECIALS!!
10% Discount on the purchase of three or more utilities

SUPER DISK COPY III

Apple II or Apple II Plus with 48K and 1 or more Disk II drive(s)

Practically a "mini-DOS" in itself, SUPER DISK COPY III is destined to become the standard for APPLE disk utilities. SDC is a menu-driven program that allows manipulation of all types of files under DOS 3.1, 3.2 and DOS 3.3.

SDC is the only disk utility available for the APPLE that combines these features: 1) COPY single files (Integer, Applesoft, Binary, or Text), 2) COPY DOS, 3) COPY entire disk, 4) UNDELETE deleted files, 5) Optional "INIT" of copy disk (with optimized "skew" factors for 13 sector disks), 6) REPLACE illegal characters in filenames, 7) FIX filesizes, 8) Use of DOS and directory sectors for up to 13K additional storage, 9) ALPHABETIZE filenames in diskette catalog 10) LOCK or UNLOCK files, 11) PLOT of disk usage, and 12) Optional rearrangement of files so.

DOS PLUS

Apple II or Apple II Plus with 32K and 1 or more Disk II drive(s)

DOS PLUS is the software solution for living with both 13-sector (DOS 3.1, DOS 3.2, DOS 3.2.1) and 16-sector (DOS 3.3) APPLE diskettes.

DOS PLUS adds 8 new commands to APPLE DOS. Three of these are built-in and the remaining five are user definable. IT IS EVEN POSSIBLE TO CHANGE DOS VERSIONS WHILE A PROGRAM IS RUNNING!

If you have a language card, DOS PLUS will quickly load it with the "missing" language. A "B" BLOAD-analysis command is also provided to display the starting address and length of the last binary file loaded.

DOS PLUS also includes a DOS COMMAND CHANGER program to allow easy customization of APPLE DOS commands to suit individual tastes.

APPLESOFT PROGRAM OPTIMIZERS (AOPT)

Apple II or Apple II Plus with 16K

AOPT is a 2.2K machine-language utility that will substantially reduce the size of an Applesoft program without affecting the operation of the program. AOPT automatically shortens variable names, removes remarks, removes unreferenced lines, appends short lines together, removes extra colons, and renumbers line numbers. AOPT will convert a verbose, well-documented, development version of a program into a memory-efficient, more-secure, production version of the same program.

APPLESOFT-PLUS STRUCTURED BASIC (APLUS)

Apple II or Apple II Plus with 16K

APLUS is a 4K machine-language utility that adds the following structured-programming commands to Applesoft basic: WHEN . . . ELSE . . FIN, UNTIL, WHILE, UNLESS, CASE, SELECT (variable), and (OTHERWISE). Multi-line IF . . . FIN statements are also supported. APLUS also allows the use of "named" subroutines or "procedures". A programmer can now instruct a program to "DO CURVE-FIT", without worrying about the location of the "TO CURVE-FIT" subroutine. APLUS automatically indents "&LIST"ed programs to clarify the logic flow. The APLUS "&CONVERT" command replaces the above structured-progamming commands with "GOTO"'s and "GOSUB"'s to provide a STANDARD Applesoft program as output.

New progams can now be written using "GOTO"-less logic. Existing Applesoft programs can be maintained using APLUS without special conversion.

PROTECTOR III

Apple II or Apple II Plus with 48K, and 2 or more Disk II drives

The PROTECTOR III is designed to make "protected" copies of a "master" DOS 3.3 disk containing Applesoft programs. The resulting "protected" disks can not be copied by presently available commercial copy programs (the APPLE COPY program, SUPER DISK COPY, the Lawrence copy program, etc.). Applesoft programs on the "protected" disks will "auto run", preventing end purchasers from "LIST"ing or "SAVE"ing programs off a "protected" disk. A USERBACKUP program is provided that can be distributed to enable end users to make unexecutable backup copies of protected disks.

DISC RECOVERY

Apple II or Apple II Plus with 48K and 1 or more Disk II drive(s)

This utility will help keep you out of trouble with its BAD BLOCK SCAN option and if you do get into trouble with a "messed up" disk, DISK RECOVERY may "save the day" with its REDO VTOC option.

The REDO VTOC option examines every file on the diskette to detect and correct the following types of errors in the disk VTOC: 1) two files trying to use the same disk sector, 2) part of a file not protected by a "sector-in-use" bit in the VTOC, and 3) "sector-in-use" bits in the VTOC that really aren't being used by any files.

MULTI-DISK CATALOG III

Apple II or Apple II Plus with 48K and a Disk II drive

MDC III is a very fast, machine-language database program designed specifically for keeping track of the contents of your APPLE diskette library. MDC III requires only seconds to read FILENAMES, FILETYPES, FILESIZES, numbers of free sectors remaining on diskette, and actual volume number from each of your diskettes. Both sides of a diskette can be loaded and assigned to the same DISK ID No. MDC III supports use of a two-character CLASSIFICATION field that can be used to group games, utilities, and other types of related files together. MDC III supports a fast Shell-Metzner. A "FLIP DOS" command allows MDC III to read directories from DOS 3.1, 3.2 and 3.3 disks and to store the resulting database on either a 13 or 16 sectored disk.

Write or Ring us for a full software catalogue. All prices plus VAT, postage and packing free. Dealers enquiries are welcome.

SBD SOFTWARE
15 Jocelyn Road, Richmond, TW9 2TJ
Telephone: 01-948 0461 Telex 22861

● Circle No. 283

Main Dealers

Birmingham
Byteshop Computerland
94/96 Hurst Street
Tel 021 622 7149

Dublin
Lendac Data Systems
8 Dawson Street
Tel 0001 372052

Glasgow
Byteshop Computerland
Magnet House
61 Waterloo Street
Tel 041 221 7409

Leeds
Holdene
Manchester Unity House
11 12 Rampart Road
Woodhouse Street
Tel 0532 459459

London
Byteshop Computerland
324 Euston Road NW1
Tel 01 387 0505

Digitus
Lading House
10/14 Bedford Street
Covent Garden WC2
Tel 01 379 6968

Jarogate
197/213 Lyham Road
Brixton SW2
Tel 01 671 6321

Manchester
Byteshop Computerland
11 Gateway House
Piccadilly Station Approach
Tel 061 236 4737

Nottingham
Byteshop Computerland
92a Upper Parliament Street
Tel 0602 40576

Southampton
Xitan Systems
23 Cumberland Place
Tel 0703 38740

Dealers

Bristol
Senton
27 St Nicholas Street
Tel 0272 276132

Cambridge
Cambridge Computer Store
1 Emmanuel Street
Tel 0223 65334

Cheshire
Holdene
82a Water Lane
Wilmslow
Tel 0625 529486

Edinburgh
Holdene Microsystems
48 Great King Street
Tel 031 557 4060

Luton
Remdex Bradley Systems
31-33 Wellington Street
Tel 0582 23682

Manchester
NSC Computers
29 Hanging Ditch
Tel 061 832 2269

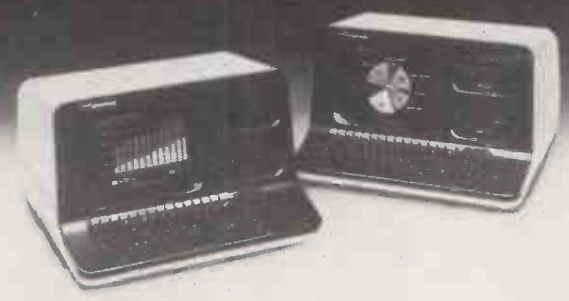
Norwich
Anglia Computer Centre
88 St Benedict's Street
Tel 0603 29652

Sheffield
Hallam Computer Systems
1 Berkeley Precinct
451 Eccleshall Road
Tel 0742 663125

Watford
Lux Computer Services
108 The Parade
High Street
Tel 0923 29513

Comart Limited
St Neots Cambs PE19 3JG
Tel (0480) 215005
Telex 32514 Comart G

Trust Comart to turn a new ADVANTAGE



into a major benefit.

ADVANTAGE™ is the exciting new, packaged high performance desk top computer with integral video screen. It brings the proven reliability, so long the hallmark of NorthStar products, into new and broader fields of application.

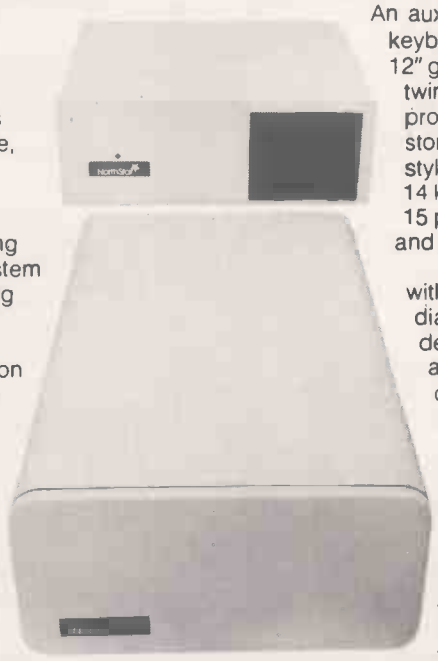
Add the established Comart technical, software, and service support and the ADVANTAGE becomes a major benefit to users looking for a low cost, yet versatile, dedicated system. NOW!

Just look at the benefits.

ADVANTAGE is economical: A complete integrated accounting system and word processing system will cost around £4500 depending on the printer and software used.

ADVANTAGE is versatile: You have the benefit of application software that is already available and proven on NORTH STAR Systems.

ADVANTAGE is new: It's Business Graphics can convert data into bar charts, pie charts, graphs, and 3D representations instantly. And, what you can see on the screen, you can print.



For the technically minded, ADVANTAGE is a 4MHz, Z80A™ based microcomputer with 64K dynamic RAM, a 20K Byte display dedicated RAM, plus 2K Boot PROM.

An auxiliary 8035 processor provides keyboard and disk control. It has a 12" green screen, and integrated twin quad capacity 5" disk drives providing 720K Bytes of data storage. It has an 87 key Selectric™ style keyboard with 9 control keys, 14 key numeric/cursor control pad, 15 programmable function keys, and 49 conventional character keys.

ADVANTAGE comes complete with Business graphics, self diagnostic software and graphics demo software. Its G-Basic/G-DOS, and Graphics CP/M™ are supersets of the industry standards. They enhance ADVANTAGE'S Graphic and Character Mode capabilities, and provide a consistent operating environment for development and application programs written in any other CP/M compatible language.

To see more of the benefits of the ADVANTAGE ask your Comart Dealer, or send now for further information.

TM Advantage is a trade mark of North Star Computers Inc
Z80A is a trade mark of Zilog Inc
Selectric is a trade mark of IBM
CP/M is a trade mark of Digital Research Inc

comart
SPECIALISTS IN MICROCOMPUTERS
A member of the Comart Group of Companies.

● Circle No. 284

HITEC

Mail Order Software

THE MORE YOU TAKE THE MORE YOU GAIN FROM COMPUTING

MILESTONE: £210.-
Manual alone: £20.-
"Critical path" network analysis program for scheduling manpower, dollars and time to maximise productivity. NEW IMPROVED. Interactive project management program that runs under CP/M. MILESTONE can be used to track paper flow, build a computer, check a department's performance, or build a bridge. MILESTONE can be used by executives, engineers, managers, and small businessmen.

- — Produce PERT chart in minutes.
- — Find critical tasks that can't be delayed.
- — Investigate tradeoffs between manpower, dollars and time.
- — Give plans to others using a printed project schedule.
- — Change details and immediately see the results on screen.
- — Balance time, manpower and costs.

Requires 56K RAM and CP/M. Specify Z80 or 8080. Also available for Apple Pascal, UCSD Pascal or CP/M-86 operating systems. (Milestone-86 version 290 1) Formats: 8, NS, MP, SB, TRS2, OB-1, XX, IPC, IDW.

ACCESS/80
A report generator and cross-tabulator. Virtually any report that can be described on paper can be generated by using your existing ASCII data files. Produces reports in minutes that would take hours to program in BASIC.
— Level I — Report Generator and Cross-Tabulator — £210.-
Read ASCII files and create sorted reports with subtotalling capability. Provides multi/dimensional cross tabulation and computation. Includes operating system commands.
— Level II — Output and Logic Processor — £354.-
Everything in Level I plus, write out new files in any sorted order (including subtotalling). Load arrays from files. Performs binary search on sorted arrays in memory. Includes control language extensions for complex applications.
Requires CP/M and 48K RAM. Formats: 8, NS, MP, CDOS, SB, TRS2, APPL.

DATEBOOK II: £210.-
Manual alone £18.-

- — Schedules appointments for up to 27 different doctors, lawyers, rooms, etc.
- — File structure allows for appointments up to one year in advance.
- — Searches for openings that fit time of day, day of week and/or day of year constraints.
- — Appointments made, modified or cancelled easily.
- — Copies of day's appointments can be printed quickly.

Requires 56K RAM and CP/M. Specify Z80 or 8080. Also available for Apple Pascal, UCSD Pascal or CP/M-86 operating systems.
Formats: 8, NS, MP, SB, APPL, TRS2, OB-1, XX, 1-5, IPC, IDW.

PERSONAL DATEBOOK — 110. Manual alone 20
Time management and appointment scheduling calendar for an individual or small office with up to nine staff members. Displays one appointment schedule on screen at a time. Cancellations can be put into hold file for easy rescheduling at your convenience. Menu driven commands do not require referral to manual.
Requires CP/M 2.x and 56k RAM. Specify Z80 or 8080. Also available for Apple Pascal, UCSD Pascal or CP/M-86 operating systems. Formats: 8, NS, MP, SB, APPL, TRS2, XX, IPC, IDW.

WHATSIT?
A data base/querry/retrieval system that communicates controversationally, accepting questions and updates in simple sentences. Store, index and retrieve information about one or more aspects of related or unrelated subjects. Information is stored under your designated "subject" and "tag" headings, which can be added to, changed or deleted at any time. 116 page manual assumes no programming knowledge. Requires CP/M, CBASIC2 AND 24k RAM. Formats: 8, NS, MP, SB, APPL, OB-1, XX.

THE FIELD COMPANION £210.-
Manual alone £20.-
Created for the needs of the travelling Salesman or Professional. Allows you to track the time spent with your clients, each client having up to four user-defined subfields. Expense accounting is provided and is itemised in a detailed journal for budgeting and tax reporting purposes. Maintains appointments and current customer list including shipping and billing addresses, year-to-date sales and person to contact for follow-up. Invoicing features retrieves required data from both customer and product lists. Special instructions and discounts are supported. Invoice copies may be output to a printer or sent to the home office via modem, permitting electronic transfer of the content of any report. Requires 56k RAM and CP/M or CP/M-86 and 128k RAM. Formats: 8, NS, MP, APPL, SB, XX, IPC, IDW.

FOOTNOTE £125.-
Automatically numbers and formats footnote calls, footnotes and text, placing footnotes on the bottom of the correct page. At the user's option, the footnotes can also be removed from the text file to a separate note file. Footnotes can be entered singly or in groups, in the middle or at the end of paragraphs. After running FOOTNOTE the user can re-edit the text, add or delete notes, and run FOOTNOTE again to re-number and re-format. Price includes PAIR, a companion program that checks that underline and BOLDFACE commands are properly terminated. Requires CP/M, WordStar, 48k RAM. Formats: 8, NS, MP, SB, APPL, OB-1, XX.

CBASIC/86: £230.-
Manual alone £20.-
Industry standard Intermediate code basic compiler with runtime interpreter for CB/M-86. Features include chaining, integer and external precision arithmetic, random and sequential records of any length (not limited to 256 bytes). Requires CP/M-86. Formats: 8, I-5.

Personal PEARL: £210.-
— User friendly application software generator. A fourth generation language, automatically creates completely new programs in CBASIC. Excellent documentation makes it easy to create "personal" software such as checking and financial programs, name, address and telephone lists, etc.
Requires CP/M, CBASIC2 and 48K RAM. Formats: 8, NS, SB, TRS2, APPL, OB-1, MP.

SPELLBINDER: £354-.
Manual alone £35.
Full feature word processing system with Office Management capabilities. Its special features include ease-of-use by office personnel, flexible print formatting & output, and powerful macro capability which allows features to be added for the unique requirements of each user. Mail list macro is included for mail merge with form letters.
Requires CP/M & 32K RAM. Formats: 8, NS, MP, CDOS, SB, APPL, XX.

ACT:
New text and prices:
CP/M compatible macro assembler family supporting all major 8 bit micros. ACT features include full macro capabilities, comprehensive pseudo ops, link file structures, cross reference map and algebraic expression processor. Requires 32k RAM and CP/M.

ACT I - 6502	£130ACT-86/88	£130
ACT I - 6800	£130ACT-6809	£130
ACT I - 8080/Z 80	£130Manuals £18	

PASCAL/M: £280.-
Manual alone £15.-
CP/M compatible language for 8080/Z80 CPUs, supports full Jensen & Wirth plus 45 extensions to Standard Pascal including Random access files,, 40 segment procedures & 16 bit BCD real type. Also includes symbolic debugger which features trapping on stores, examining and changing variables and tracing of program execution. Requires CP/M 2.2 & 56K RAM. Formats: 8, NS, APPL, TRS2.

PASCAL/M for 8086/88: £350.-
Manual alone £15.-
All the features of PASCAL/M for the 8086 and 8088 processors running under CP/M-86.
Requires CP/M-86 and K RAM. Formats: 8, 1-5.

PASCAL: Sort - £140.-
Manual alone £14.-
Fully commented source code into which the user simply places the particular file description and sequence requirements to obtain the desired sort. Can run standalone or as a overlayed segment of larger program. Uses indirect Shell-Metzner in RAM, interleaved polyphase (Fibonacci) merge on disk, full sector buffering and shortest seek logic. Can match machine language sorts even under Pcode interpretation. Requires CP/M 2.x and 56k RAM and CP/M-86 and 128k RAM. Pascal?M,UCSD Pascal or Pascal /MT. Formats: 8, NS, APPL, XX, MP, TRS2, IPC IDW.

SUPERCALC: £210.-
Allows a layman to manipulate business data in a variety of forecasting and accounting applications. Combines the interactive nature of an electronic spreadsheet with the power and convenience of a simple simulation language. Video display can be scrolled over entire worksheet using cursor controls. Symbolic vector reverrences eliminate repetitive low level data manipulation commands. Easy to use menu driven "Help" commands. Requires CP/M and 48K RAM. Formats: 8, NS, MP, SB, APPL, TRS2.
Call for terminal formats.

SUPERDOS: £100.-
Upgrade of CP/M2.2 for Superbrain. Includes ADM/31 Hazeltine, or Superbrain Terminal emulation mode. Other new features include 132 character keyboard buffer, repeat on all keys, key click, user programmable numeric keypad, 30% disk read/write improvement, real time clock, baud rates to 19,2K on RS232 ports, printer handshake modes, 4 new utilities, and 4 fixes.
Requires Superbrain 3.0. Format: SB.

TRANS 86 — £104.-
Manual alone £15.-
8086/88 Translator for existing 8080/Z80 programs. New source code is easily edited and assembled using ACT II to produce hex code which is executed by 8086/88 CPU. Emphasizes the extensions and features available in the 8086/88.
Requires CP/M & 32K Ram. Formats: 8, NS, APPL, OB 1, XX.

MAILER — £75.-
A fast and easy to use mailing list program. Address labels can get printed in any desired order including alphabetically. Data can be selected. APPL.

IMP — £310.-
Instant mathematical programming for complex engineering design as well as allocation problems, statistics, transport and many other applications. It allows a user to enter difficult mathematical problems (simultaneous non-linear equations, linear programming constructs and multivariate analysis problems) in simple algebraic form. APPL.

COPYRIGHT:
Access/80 Friends Software; Pearl Relational Systems; Pascal/M, ACT, Trans 86, Supercalc Sorcim, CBASIC 2, CBASIC/86 Compiler Systems; Datebook II, Milestone, Textwriter III Organic Software; Spellguard ISA; CP/M, CP/M-86 Digital Research; Superbrain Intertec Data Systems; S-Basic Topaz Programming; Spellbinder Lexisoft; Selector IV; Selector/86, Glector Micro Ap.
Prices quoted do not include dealer installation and training. Prices and availability subject to change without notice.

HITEC
Datenverarbeitungs- und Betriebsberatungs GmbH

London 5 to 9
17 WIGMORE STREET LONDON, W1H 9LA.

ORDERS must specify disk type and format. Add 15% VAT to orders. Add £1 per item postage and packing. All orders must be prepaid. Make cheques, POs etc payable to HITEC Company, 5 to 9, 17 Wigmore Street, London W1H 9LA. Manual costs are deductible from subsequent software purchase. Dealer Inquiries welcome.

S.B.D. Software is proud to announce their distribution agreement with the most up to date APPLE-only magazine in America.

CALL A.P.P.L.E. MAGAZINE

In today's fast changing world of the APPLE you just can't afford to stay behind, so don't settle for anything less than the best APPLE-only magazine in America.

Now you can purchase this outstanding magazine for the low price of £1.75 per issue.

Your subscription for 12 or 24 magazines may start from any month in 1981.

Single back issues are available at £2.25 per issue including postage and packing.

A bound volume of the issues in 1980, 1979, 1978 are available for £20.00, £15.00 and £10.00 respectively, including postage and packaging.

(Please note that in 1980 & 1981 there were only 9 issues published but in 1982 there will be 12 issues.)

☐ 12 issues @ £21.00 ☐ 24 issues @ £40.00

Europe Air Mail postage, add £6 per 12 issues

NAME .....

ADDRESS .....

TOWN ..... POSTCODE .....

Please start my subscription ..... Month ..... Year

....

Barclaycard/Access Number Expiry Date

Please make cheques payable to CALL APPLE (UK)

Send to:- CALL APPLE (UK), c/o SBD Software, FREEPOST, RICHMOND, SURREY TW9 1BR (No postage stamp required) Telephone: 01-940 5194

The Famous Book

"ALL ABOUT APPLESOFT"

Now available @ £9.50 incl. P. & P.

● Circle No. 286

APPLE II

and

ITT2020 PAYROLL

£30.43

A program with many outstanding features in spite of its low price! Example: If you enter net pay — the program will compute gross pay deductions!

HEWLETT-PACKARD 9845 Spline: Upwards compatible with HP Spline but: four times faster, more accurate, more versatile. Also available For HP85. £43.48 + Tape cost.

Also: **ZX81** + 16K programs to professional standard: full-featured **PAYROLL** £21.74.* fast, flexible, big (16 to 48K) **STOCK CONTROL PACKAGE** £21.74* Critical Path Analysis £13.04*Business or Home **BUDGET** Program £13.04*LOAN, **VAT, MORTGAGE** £6.96 for all three **GOLD** — a good adventure game with a chance to win a Memotech £6.96*RELIABLE **16K RAM** Pack £36.52*Memotech 48K RAM.

Prices include Postage and Packing, but VAT must be added.

Details from and orders to:

HILDERBAY LTD
8/10 PARKWAY, REGENTS PARK
LONDON NW1 7AA
TELEPHONE 01-485 1059 **TELEX 22870**

● Circle No. 287

SIMPLICALC

NEW!

FOR EVEN 8K PETS.....FROM CRONITE

For the first time, you can have a visual electronic calculator on even the smallest Commodore Pet, with no need for a disk drive.

You can move your screen around on your electronic worksheet, adding and deleting and recalculating . . . and if you think that sounds familiar, you're right. SimpliCalc was written to provide the main facilities of programs like VisiCalc™ on machines which do not have the 32K and disk drive required for VisiCalc™. Now the real power of your micro can be harnessed at a quarter of the cost of larger programs.

- ★ **Runs even in 8K**
- ★ **Writes figures or alphabetic characters on your sheet**
- ★ **Allows easy change or deletion**
- ★ **Can save your sheet for future use**
- ★ **Lets you print out your sheet on PET printers**
- ★ **Uses cassette or disk**
- ★ **Allows formulae to be set up for rapid recalculation**
- ★ **Shows you your sheet on the screen all the time**
- ★ **Allows replication of columns and rows**

What can you use it for? It's limited only by your imagination; any tabular computation, especially where you want to adjust and recalculate, is ideal. The Cronite Group uses it for costing, modelling, consolidation and capital investment appraisals. Try these:

- ★ **Education — business studies and economics**
- ★ **Investment analysis**
- ★ **Household budgeting**
- ★ **Financial modelling and cash flow**
- ★ **Costing**
- ★ **Tax computations — personal or business**

To obtain your copy of this versatile numeric tool, with comprehensive manual, send cheque with order, specifying whether your CBM is ★ 2001/3000/early 4000 (PEEK (144) = 46) ★ late 4000 series ★ 8032 and whether you want cassette **£29.90 inc. VAT** or disk **£36.80 inc. VAT** (specify drive) to:
SIMPLICALC — The Cronite Group Limited, Montgomery Street, Birmingham B11 1DT.

Further versions for other popular micros e.g. VIC 20 are planned; enquiries welcome.

Further details from Mark Turner on 021-773 8281 — telex 338247

VisiCalc is a trade mark of Personal Software Inc.

● Circle No. 288

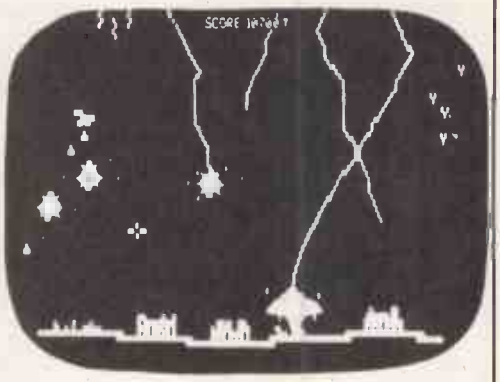
SOS Missile Command...Multihead Destructors destroyed city...SOS Missile Command...Cluster Mines sighted...SOS Missile Command...Plasma Projectile assault...SOS Missile Command...Satellite Bombs in range...SOS Missile Command...Megon Annihilator destroyed further city...SOS

Kansas £350 'COMMAND' CONTEST
Computer Fair—Earls Court
April 23—25

Missile Command

Together, Mike Chalk and Kansas bring you not just another Arcade game

. . . an EXPERIENCE !



YOU command the ground-to-air missiles to save the cities from total Alien destruction, progressing to TEN levels of difficulty from not-to-easy to bloody impossible! Multiple displays with five types of Aliens and Satellite Bomber. Infinite missile 'sight' control.

Based on the Arcade game of the same name, this is easily the finest computer game of its kind available today. It demands quick responses and no small amount of skill to overcome the Aliens even at the lower levels of play. As the game proceeds, so does the risk of total ahiliation, giving at last, a very, very competitive game indeed, and one which will satisfy even the very skilled gamesman.

Available only from Kansas—£9.50

Kansas

Programs for the TRS-80 and Video Genie. All prices are Vat paid and post free. Same-day first class return post service. All software in stock and fully guaranteed as we are the actual publishers. Free catalogue upon request. ACCESS & BARCLAYCARD WELCOME

Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, S44 5XF. Tel. 0246 850357

TWICKENHAM

COMPUTER CENTRE LTD

With the best microcomputers available

VIC 20 commodore apple II

½ day Wednesday – 'phone for latest Prices

SPECIAL OFFER ☆ WE PAY YOUR VAT ON MOST ITEMS ☆

PRINTERS	SOFTWARE	ACCESSORIES
Anadex	Micro Modeller	Z-80 Softcard
Epsom	Visicalc	Monitors
Ricoh	Magic Window	Graphics Tablet

NEW TO OUR RANGE Prestel with tandy **£170.00 + VAT.**

01 - 892 7896
01 - 891 1612

TWICKENHAM COMPUTER CENTRE LIMITED
72, Heath Road Twickenham Middlesex TW1 4BW

VISA

● Circle No. 289

The Network has arrived...

and with it, the cost effective alternative to dumb terminals and expensive minimainframes.

The TeleVideo computer family from Encotel puts total processing power where it's needed — in the hands of the user — while allowing expansion without compromise to individual terminal performance.

MmmOST* and CP/M® together protect both software investment and the route to upwards expansion. They provide all the house-keeping required to run a multiple user database and ensure that application programs will not have to be re-written no matter how big the system grows. Any of today's most popular languages, such as **COBOL, BASIC** and **FORTRAN** can be used.

The TeleVideo family will expand from the stand-alone System I with its 64Kbytes of user RAM and 1Mbytes of floppy disk up to the 16-user System III with its 70Mbytes of hard disk Winchester, without hardware redundancy.

Furthermore, the RS422 800Kbit/second data links make each highly intelligent terminal look like a mainframe.

Only the low price says it isn't.

For instance the six terminal System 2 with its 10Mbytes of hard disk and 384Kbytes memory starts at around **£10,000†.**

As expected from a world class terminal manufacturer like TeleVideo the TS80 terminals used to expand Systems 2 and 3 are exceptional. The 64Kbytes of RAM, serial printer port and separate processors for compute and display ensure that they will never lack power.

And that the user will never be out of pocket.

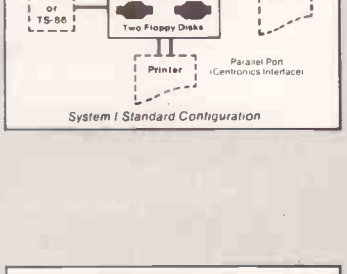
**Multiuser multitask multiprocessor Operating Systems Technology®*

†based on 2$ exchange rate.

Specifications

System I

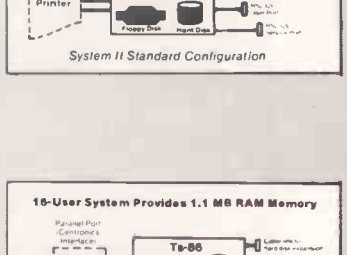
Single-board processor
containing 1 Z80A 64K of RAM memory.
4K EPROM for diagnostics
1.0Mbytes of on-line mini-floppy disk storage
TeleVideo Model 910 CRT terminal
with all Model 910 capabilities (950 terminal optional).
£2,280.00



System I Standard Configuration

System II

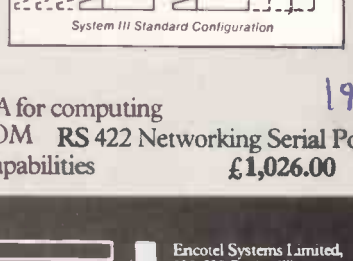
Supports up to six users
Single board design
Z80A, 64K of RAM memory
4K EPROM
10Mbytes 5¼" Winchester disk drive
1.0Mbyte mini-floppy disk back-up unit
Parallel port and two serial ports for printer attachment and servicing
With one TS80 **£5,130.00**



System II Standard Configuration

System III

Supports up to 16-users processing network contains, Z80A, 64K of RAM memory, 4K EPROM
23.5Mbyte 8" Winchester disk drive
MmmOST* Service Processing System. 2 x TS80 **£12,022.00**



System III Standard Configuration

TS 80 Satellite User Station

6502 CPU for video control Z80A for computing
64K of RAM memory 4K EPROM RS 422 Networking Serial Port
Full-screen editing and graphics capabilities **£1,026.00**

199

rom the people who believe in Quality, Reliability and Support.
imited opportunities available for appointments as dealer representatives
n selected areas.

Encotel Systems Limited,
530-539 Purley Way,
CROYDON, Surrey.
Tel: 01-686 9687 & Telex: 2656(

● Circle No. 2

Combine accurate flight characteristics with the best in animation graphics and you'll have SubLOGIC's

T80-FS1 Flight Simulator

for the TRS-80

SubLOGIC's T80-FS1 is the smooth, realistic simulator that gives you a real-time, 3-D, out-of-the-cockpit view of flight.

Thanks to fast animation and accurate representation of flight, the non-pilot can now learn basic flight control, including take-offs and landings! And experienced pilots will recognize how thoroughly they can explore the aircraft's characteristics.

Once you've acquired flight proficiency, you can engage in the exciting British Ace 3-D Aerial Battle Game included in the package. Destroy the enemy's fuel-depot while evading enemy fighters.

Computer and aviation experts call the T80-FS1 a marvel of modern technology. *You'll* simply call it *fantastic!*

Special Features:
- 3 frame-per-second flicker free animation
- Maximum transfer keyboard input
- Constant feedback cassette loader

Hardware Requirements:
- Radio Shack TRS-80, Level 1 or 2
- 16K memory
- *Nothing else!*

Only £17

INCLUDING VAT POST & PACKING. SEND £1.00 FOR DESCRIPTIVE CATALOGUE OF OVER 200 TRS-80 PROGRAMS.

BARCLAYCARD VISA — Buy it with Access

MICROCOMPUTER APPLICATIONS
42A CHURCH STREET,
CAVERSHAM, READING,
RG4 8AU, ENGLAND.
TEL: (0734) 470425

TRADE AND EXPORT

Definitely the very best deal for

O.E.M., DISTRIBUTORS AND DEALERS

throughout Europe

THE SINGLE SOURCE FOR MICROCOMPUTER EQUIPMENT, PERIPHERALS, SUPPLIES AND SOFTWARE

EPSON – ANADEX – TEXAS INSTRUMENTS – QUME – DIABLO – NEC – RICOH – OKI – CENTRONICS – TEC – OLYMPIA – ADLER – APPLE – COMMODORE – HITACHI – SHUGART – CONTROL DATA – BASF – FACIT – FUJITSU – PRINTRONIX – DATA PRODUCTS – OLIVETTI – ETC. ETC.

Obtain substantial savings by combining your purchases with hundreds of other trade buyers throughout Europe

- **No commitment to purchase minimum quantity**
- **Parts and labour warranty**
- **Fast delivery**

Telephone or write for details of
INFORMEX CONSORTIUM PURCHASE SCHEME

INFORMEX-LONDON LTD
8-12 Lee High Road, London SE13 5LQ
Tel: 01-318 4213 (10 lines) Telex: 892622

INFORMEX

AGENTS REQUIRED WORLDWIDE

● Circle No. 294

Check our prices against similar lists!!!

Micro Business Centre Ltd,
Linthouse Lane, Wednesfield,
Wolverhampton, West Midlands.
Tel (0902) 725687

NEW SHOP

Check our prices against similar lists!!!

A.B.C. Ltd,
Sutton Computer Centre, 28 High Street,
Sutton Coldfield, West Midlands.
Tel 021-354-2684

MICROCOMPUTERS

AT:

ABC HARDWARE — JUST LOOK AT THESE PRICES!!!!!!!

★ 12" Green Screen Monitor + cable	99.95
★ New! Colour Card for Apple — true colours, inc. mod.	49.95
★ Box of 10 blank discs	14.95

Add 15% V.A.T. (P&P inc.)

APPLE

	Cost	V.A.T.	Total
★ Apple 111	2545.00	381.75	2926.75
★ Disk 111	385.00	57.75	442.75
Silentype 111	222.00	33.30	255.30
★ Apple 11 48k. + colour card, modulator	695.00	104.25	799.25
★ Disk Drive + contr.3.3	375.00	56.25	431.25
★ Disk Drive	295.00	44.25	339.25
★ 12" Green Screen Monitor	99.95	14.99	114.94
Programmers Aid	26.00	3.90	29.90
Autostart Rom Pack	33.00	4.95	37.95
★ Versawriter — graphics pad	149.95		
★ Silentype	195.00	29.25	224.25
★ Tantel (Prestel)	170.00	25.50	195.50
B/W Modulator	14.00	2.10	16.10
Pascal Lang. System	245.00	36.75	281.75
Applesoft Firmware Card	95.00	14.25	109.25
Integer card	95.00	14.25	109.25
16k. Ram Card (48k- 64k.)	95.00	14.25	109.25
Apple Pilot	79.00	11.85	90.85
Apple Fortran	105.00	15.75	120.75
Apple Prototype/Hobby Card	12.00	1.80	13.80
Parallel Printer Interface	65.00	9.75	74.75
High Speed Serial Interf	65.00	9.75	74.75
Centronics Card	65.00	9.75	74.75
Communications Card	103.00	15.45	118.45
Colour Card inc. T.V. mod true colours	49.95	7.49	57.44
IEEE-488 Interface	230.00	34.50	264.50
Thermal Paper for Silentype	2.75	.41	3.16
C.P.S. Multifunction Card (Clock/Printer Card)	135.00	20.25	155.25
Supertalker	140.00	21.00	161.00
Romplus + Keyboard Filter	127.00	19.05	146.05
Rom Writer	105.00	15.75	120.75
AD + DA 16 Channel	210.00	31.50	241.50
Numeric Keypad	75.00	11.25	86.25
Videx 80 col card	185.00	27.75	212.75

JUST AVAILABLE — NEW PRODUCTS TO ENHANCE YOUR APPLE SYSTEM

Apple 5.25" Winchester from:	1872.00	280.80	152.80
Join up to 127 Apples with "R.O.S."	449.00	67.35	516.35
Micro Modem	169.00	25.35	194.35
The Mill (6809 board)	230.00	34.50	264.50
Expeditor Basic Compiler	79.95	12.00	91.95
Micro Modeller	399.00	59.85	458.85
Micro Planner	695.00	104.25	799.25

EXCLUSIVE ABC SOFTWARE

DISKIO — Disk program and file recovery system — you'll wonder how you managed without it! Send for full details.

	49.95	7.50	57.45

INTEGRATED SALES/PURCHASE/NOMINAL LEDGER SYSTEM, WILL SUPPORT 50 — 5000 ACCOUNTS. WRITTEN AND FULLY SUPPORTED BY OUR QUALIFIED STAFF. AVAILABLE INTEGRATED OR STAND ALONE.

Integrated	889.95	133.50	1023.45
Stand Alone	349.00	52.35	401.35

COMMODORE PETS AT CASH AND CARRY PRICES!!!!!!

Looking for a Pet computer? — try us last — up to 12.5% off list prices PLUS £50.00 TRADE-IN for your Sinclair ZX80 or 81. Pet 4083 (new screen), Pet 8032, Disk Drives, Printers, etc, all in stock.

VIC PERSONAL COMPUTERS — on continuous demonstration at both showrooms.

CIFER MICROCOMPUTERS

British Made — Twin Z80 (4MHZ) Microcomputer System + CPM 80 column display — 64k. User Memory + 64k. Screen Memory

2600 RANGE

2683	£1970.00 ex V.A.T.
2684 (400k. integral DD)	£2357.00 ex V.A.T.
1880 RANGE (All integral drives + 1000 × 300 point graphics)	
1886 (2 × 800k. integral DD)	£2700.00 ex V.A.T.
1888 (3 × 800k. integral DD)	£3150.00 ex V.A.T.
1885 (6 to 12 mgb.) from	£4530.00 ex V.A.T.
1887 (1 × 800k. + 1 Winchester)	£4980.00 ex V.A.T.

PRINTERS

Selection from our vast range:

	Cost	V.A.T.	Total
Epson MX 100	549.95	82.50	632.45
Epson MX 82/F/T	399.95	60.00	449.95
Olympia Scripta K.S.R.	945.00	141.75	1086.75
Olympia Scripta R.O.	775.00	116.25	891.25

COMPUTER BOOKS + MAGAZINES — GOOD SELECTION IN BOTH SHOWROOMS

Beneath Apple D.O.S.	12.95
Computers for Kids (Apple, Pet, TRS80)	4.95
Introd. to Pascal	11.50
Z80 Assembly	12.80
Basic Applications	7.95

(No VAT — sent by return post — many other titles)

Note: All goods in stock at time of going to press. We will not be beaten on prices, phone David Anderson for latest prices. Allow 7 days for cheque clearance. Advantageous leasing terms for businesses. Suppliers of Micro Computers to Public Companies — Local Authorities — Educational Establishments etc.

● **Circle No. 295**

FAR INTO THE FUTURE

wabash

Only Wabash guarantees its diskettes well into the future. Five years for Maxi-Myte 8" Diskettes, and two years for Mini-Myte 5¼" Diskettes. You can trust your data with Wabash for years to come.
Write or phone for a free brochure and immediate prices.

ABRAXAS MEDIA SUPPLIES
357 EUSTON ROAD, LONDON NW1 3AL. TEL: 01-388 2061

DEALERS!

INCREASE YOUR PROFIT MARGIN

Share in our success by supplying Wabash diskettes, the only diskettes that carry five or two year performance guarantees. Phone Abraxas Media Supplies now for excellent prices

01-388 2061

● Circle No. 290

LEARN PROGRAMMING & MICROS IN CAMBRIDGE

SHORT COURSES

"PROGRAMMING IN BASIC"
Dates: 25-27 January, 10-12 March & 21-23 April

"PROGRAMMING IN PASCAL"
Dates: 18-22 January & 22-26 March

"MICROCOMPUTERS IN BUSINESS & INDUSTRY"
Dates: 22-26 February

"INTRODUCTION TO DESIGN OF MICROPROCESSOR SYSTEMS"
Dates: 1-5 February & 29 March-2 April

"ADVANCED SYSTEMS DESIGN USING PASCAL"
Dates: 15-19 February & 26-30 April

Write or phone for Course Prospectus and Booking Form

CAMBRIDGE MICRO COMPUTERS LTD
Cambridge Science Park
Milton Road
Cambridge CB4 4BN
Telephone: 0223-314666

● Circle No. 291

SHARP
First, and foremost

SPOILT FOR CHOICE?

We agree it's not easy, but we'll try and make it a bit easier.

We'll listen to you; about your business, your needs and your requirements of the computer.

We'll discuss possible solutions and demonstrate some of these to you.

If it can't be done, we'll tell you — we've been in computers long enough to know when to say no.

We have a wide range of packages available, from our associate company, Micro Technology, in word processing, accounting and financial planning.

We'll deliver and install your system and spend a day tutoring you in the areas you wish to know about.

Lastly, sorry, we can't offer discounts. We consider our time and your time is valuable, and the potential benefits of a sound choice invaluable to your business.

Technolink Europa LIMITED 0892 32116 TELEX 95441 Teclin-G

CHELTENHAM HO, 62 MT. PLEASANT, TUNBRIDGE WELLS

● Circle No. 297

CP/M Z80/8080 SOFTWARE
now on mail order from
digital devices ltd

SuperSoft

EXCLUSIVE EUROPEAN DISTRIBUTORS

C Compiler
The compiler supports most of version 7 Unix standard C. • Macro expansions • Include files. • Inline assembly code. • Object code may be ROMed • Programs may be ORGed for any location • Completely dynamic memory allocation is supported • A two pass compiler, the first pass of the compiler produces an intermediate code • Pass two contains both the translator and the optimizer • An important feature of the compiler is that assembly code is produced • "Hand optimization" of critical sections is possible • Re-entrant code.
Requires: 48K CP/M, (more recommended)
C compiler: £115.00 Manual only: £15.00
Z8000 cross-compiler: £265.00 (CP/M to Z8000 code, requires Z8000 assembler)
Manual only: £15.00

FORTRAN IV & RATFOR
The SSS FORTRAN compiler is fast, efficient, and complete (full 1966 ANSI standard with extensions). RATFOR complier compiles into FORTRAN allowing the user to write structured code while retaining the benefits of FORTRAN • Many advanced features supported • complex arithmetic • character variables • functions • SSS RATFOR allows the use of contemporary structured programming tecniques • REPEAT ... UNTIL ... WHILE IF ... THEN ... ELSE ... • SSS RATFOR is supplied with source code.
Requires 32K CP/M, Z80 only

SSS FORTRAN (Signed licence required)	£140.00
RATFOR (For SSS FORTRAN only)	£65.00
RATFOR manual only:	£5.00
FORTRAN manual only:	£15.00

FORTH
StackWork's FORTH is full, extended FORTH interpreter/compiler that produces COMPACT, ROMable code • As fast as compiled FORTRAN • As easy to use as interactive BASIC • SELF COMPILING includes every line of source code necessary to re-compile itself; EXTENSIBLE , add functions at will; CP/M COMPATIBLE; Z80 & 8080 ASSEMBLERS included. (Please specify).
£115.00 Manual only: £25.00

DIAGNOSTICS I
DIAGNOSTICS I is a complete program package designed to check every major area of your computer.
• Memory Test • CPU Test (8080/8085/Z80)
• Printer Test • Disk Test • CRT Test
Requires: 32K CP/M
£52.00 Manual only: £10.00

DIAGNOSTICS II
As DIAGNOSTICS I with extensions • Every test is "submit"-able • All output can be directed to a log file for unattended operation • A quick-test has been added for quick verification of the working of the system • Memory test includes • Default to the size of the CP/M Transient Program Area • Printout of a graphic memory map • Burn in test • Bank selection option • Memory speed test • A Spinwriter/Diablo/Qume test has been added. (Serial interface only).
Requires: 32K CP/M
£65.00 Manual only: £10.00

UTILITY PACK I
Utility Pack I is a collection of versatile general purpose routines that can speed program development • GREP Searches a list of files for the specified string • CMP Compares two files and displays the differences • AR Archiver. Puts many files into one large file which has its own directory • SORT In RAM variable length record shell sort • Many more.
Requires: 24K CP/M £45.00

UTILITY PACK II
• TR Translates one user defined set of characters in a list of files to another set • RPL Replaces every occurance of one user defined string in a list of files with another string • DIFF Compares two source files and displays the minimum number of differences • CAT Concentrates a list of files • Many more.
Requires: 32K CP/M £45.00

DISK DOCTOR
DISK DOCTOR for CP/M: a program to recover "crashed" discettes AUTOMATICALLY! • DISK DOCTOR does not require any knowledge of CP/M file structure! If you can operate CP/M, then you can use DISK DOCTOR • Verifies discettes and locks out bad sectors without touching the good files that remain • Copies whatever can be read from a "crashed" file and places it into a good file. • Copies discettes without stopping for bad sectors. • "Un-erases" files.
Requires 48K CP/M. Two drives are needed for complete operation.
£65.00 Manual only: £5.00

ENCODE/DECODE I/II
ENCODE/DECODE is a sophisticated coding system for CP/M. Essentially, one codes files when they are not needed and decodes the files when access is required. Access is inhibited in two ways. First, there is a user defined password. Second, the user defined combination is needed to decode a file. There are 10,000,000,000 possible combinations! The essential difference between I & II is that a second hash is done using the user supplied combination. Requires: 32K CP/M

ENCODE/DECODE I:	£40.00
ENCODE/DECODE II:	£65.00
Manuals only:	£15.00

TERM II
The TERM II subsystem is an interactive program allowing any CP/M computer to communicate with other TERM II user and other computers in general. • Users may "talk" easily to one another • Users may transmit selected ASCII files to one another and with an external computer system by emulating an ASCII terminal • Perform, under user control, character translation • TERM II is distributed as an 8080 assemble source file and requires the user to patch the modern ports into the program.
Requires: 32K CP/M
£115.00 Manual only: £10.00

MAG

PRISM is a complete information management system integrating the best features of a versatile database system with those of a sophisticated program development system • PRISM/IMS is the database management section • No programming whatsoever is required; applications include • Patient records • Information control • Customer lists • Entirely menu operated, yet uses multi-keyed files • Powerful browse and query capability.

PRISM/ADS is a complete development tool for specialized applications: • User defined menus • Screen management functions • Complete library of fully debugged routines (e.g. entry & edit) • Complete file management system provided.

PRISM/LMS is the ultimate multipurpose list management system. 1001 uses — mailing lists, customer lists, parts lists etc. Store the information you require. Menu driven. Fully formatted. No programming or technical expertise.
PRISM requires: 48K CP/M & CBASIC 2. Cursor addressing CRT with clear screen.
PRISM ADS includes PRISM IMS.

PRISM/ADS £585.00	Manual only: £80.00
PRISM/IMS £380.00	Manual only: £68.00
PRISM/LMS £210.00	Manual only: £55.00

MAGSAM
Picks up where your BASIC leaves off by providing it with a powerful Keyed File Management System that is quick and easy to use; providing features seldom found on any computer micro, mini or mainframe • Sophisticated access techniques, random, sequential and generic retrievals by key.
• Secondary indexing with any number of keys • Key and record deletes with auto reclaim of freed space • Concantenated keys • File structures are dynamically allocated, and compatible with BASIC file facilities • Interactive tutorial and file dump facilities.
MAGSAM III CBASIC 2, Microsoft BASIC 80 compiler/interpreter 8080 or Z80.
£136.00 Manual only: £55.00
MAGSAM IV high performance assembler version 75% faster than III.
C BASIC only Source 8080 assembler
£240.00 Manual only: £55.00
Magsam needs 32K, 48K recommended if memory is critical, telephone hot-line for exact details of your implementation needs.

ECOSOFT

MICROSTAT 2. Advanced stats pack for use in research, education and industry. • Complete Data Management Subsystem. • Includes edit, sort, rank order and many more. • Data transforms, arithmetic and logarithmic. • Hypothesis tests. • ANOVA. • Simple & multiple regression. • Correlation analysis. • 11 Non-parametric tests. Also includes • Moments • Skewness • Kurtosis • Stepwise multiple regression • Faster sort • Longer file names • Ability to declare each data file's numeric precision • Expanded manual giving equations and file structures.
Available in CBASIC-2, Microsoft BASIC 80, & North Star DOS.
£175.00 Manual only: £25.00

PEACH TREE

MAGIC WAND, a word processing package that is simple to use. Full screen 80 column text editing including: • Character, word, line delete, character, paragraph insert • Block copy, move or delete • Forward or backward page or line scroll • Margins left, top and bottom, flush and justify • Merge with external data files. Powerful print processor includes: • Automatic margins and paragraph indentation • Pagination • Headers and footers • True proportional spacing with speciality printer • Conditional print commands at run time.
Requires: 32K CP/M and CRT with addressable cursor.
Available on North Star Horizon or Superbrain, specify printer and VDU.
£180.00 Manual only: £20.00
MAGIC SPELL £140.00

NORTH STAR HORIZON
MATCHMAKER I and II from SoHo • Converts N*BASIC programs to run under CP/M.
Converts BASIC to a COM file • Programs convert by loading and restoring • Version II for DOS 5.2 • Version I for DOS 5.1 • Totally self-installing under CP/M 2 • North Star Horizon only.
MATCHMAKER I £65.00 Manual only: £5.00
MATCHMAKER II £75.00 Manual only: £10.00
NORTH STAR BUS from SZ Software • Global line editor with scrolling • 26 commands for locate, change, line, insert, copy, append, line move, erase columns, etc. • Packs programs. • Formatted printing with full cross-referencing of all variables, strings, arrays, functions and subroutines • co-resident with BASIC or ROMable.
NORTH STAR SORT • Adds "SRT" statement • Co-resident or ROMable • Sorts 1800% faster • Sorts 1 & 2 dimensional arrays and strings.
North Star BUS £50.00 North Star SORT £60.00
Manuals only: £10.00

Terms & Conditions
Software available from stock on North Star 5:25 in SS/SD, (occasionally on DS/DD), 8.00 in IBM 3740 SS/SD, and on Superbrain DD/QD, other formats available please enquire.
Cash with order please. Post & Packing at £1.00 per item, plus VAT at 15%. All orders sent 1st class post. The manual cost is deductable on subsequent software purchases. No VAT on manuals. Dealer terms available on request.

Technical advice HOT-LINE (0892) 20307, answered only when technician available.

BARCLAYCARD, ACCESS, DINERS CLUB, AMERICAN EXPRESS, ACCEPTED.

DIGITAL DEVICES LIMITED
134 LONDON ROAD . SOUTHBOROUGH
TUNBRIDGE WELLS . KENT
Tel: (0892) 37977-9/39546-9 Telex: 95582

The following are registered trademarks: Z80 and Z8000 of Zilog Inc., CP/M of Digital Research, UNIX of Bell Laboratories, CBASIC-2 of Compiler Systems, Microsoft Basic 80 of Microsoft Inc., North Star of North Star Computers Inc., PRISM and MAGSAM of Micro Applications Group, MICROSTAT II of Ecosoft Inc.

● Circle No. 298

£100 COMPUTER

"Can do the job of a micro costing four times as much."!
Personal Computer World

CASIO FX-702P POCKET COMPUTER

ONLY £86.91 + VAT, Total £99.95

Plus FREE MICROL Professional Programming Pack (RRP £9.95)
Or we will beat any lower advertised price by 5%

Eat your hearts out, H-P, Sharp and Texas!

The Casio FX-702P features: The biggest program storage capacity (up to 1680 steps), the biggest data storage capacity (up to 226 memories), the widest range of math, science and statistics functions (55 in all, including Regression and Correlation), the most powerful English-like BASIC program-writing language and the fastest operation, for results without waiting! Subroutines; 10 levels, FOR: NEXT looping; 8 levels. Comprehensive edit, debug and trace modes. 240 hours battery life. 17 x 165 x 82mm.

FA-2. Cassette adaptor for bulk storage of programs and data, with powerful file name and remote control options. **ONLY £17.35 + VAT, Total £19.95.**

FP-10. Permanent hard copy printer; full 20 character line width, fast 40 character per second print speed. 2,600 lines per roll. (Low cost replacement rolls, £2.50 for five). 6,000 to 9,600 lines battery life. Rechargeable battery pack, **NP-4M,** prints 13,000 lines **(£6.90).** Mains adaptor, **AD-4150, £5.**

FP-10 Printer ONLY £39.09 + VAT, Total £44.95.
Plus FREE Pack worth £5, or we will beat any lower price by 5%

SYSTEM PRICES — Save up to £50 on RRP

PACK A: FX- 702P % Microl Professional Programming Pack	**£99.95**
PACK B: FX-702 P+ FA-2 cassette interface + PPP + PROCOS	**£139.95**
PACK C: FX-702P + FP-10 Printer + FA-2 + PPP + PROCOS	**£179.95**

CASIO FX-702P USER SUPPORT
Produced by **MICROIL** exclusively for **TEMPUS**

Professional Programming Pack. Get the best from your FX-702P with: PROFESSIONAL PROGRAMMING — practical 702 programming from the ground up plus 702 REFERENCE MANUAL — definitive guide to every 702 program command — INVALUABLE! **MICROL 702 PPP. Price £9.95**

MICROL PROCOS FOR PROFESSIONAL USERS

Now you can create powerful, reliable programs in just minutes, even if you have never programmed a computer before!

MICROL PROCOS is an advanced integrated operating system that cuts programming time by 80-90% In most applications areas, saving many hours of valuable time. PROCOS A and PROCOS B are supplied together on a ready-to-run cassette, with a fully detailed User Manual offering features to suit every application. PROCOS A is ideal for complex multi-variable calculations, while PROCOS B provides many of the features of a 'Visicalc' type modelling system — answers 'what if' questions and analyses trends. Both systems feature easy-to-use commands and support FP-10 print options. Brochure on request.

MICROL PROCOS (A+B) Price £24.96

MICROL 702 Basic: Plus. Add the power of up to 20 new commands to your programs! Custom-made to ease advanced programming — features include: String — number conversions; single-shot, await, timed KEY with user-controlled return values; programmable RAN # generator; DATA-PACKING — up to 2000 single digit, single name variables; INTEGRATED DISPLAY COMMANDS — display data and text with extra-low memory overheads. Modular design uses minimum memory; easy to customise. Full-detail User Manual plus Program List for direct entry.
Available February 1982 **MICROL 702 B:P. Price £10.95**

CASIO FX-602P The World's fastest Programmable?
Alpha/numeric scrolling display. From 32 program steps with 88 memories, to 512 steps with 22 memories, all non-volatile. **ONLY £65.17 + VAT, = £74.95. FA-2 £19.95 incl. FP-10 £44.95 incl.** (Compatible with FX-501/2P, & 601P)

CATALOGUE of latest CASIO calculators, watches and keyboards, including the **Revolutionary Casiotone 701** fully programmable polyphonic keyboard, available on request. 14p stamp appreciated.

PRICE includes VAT, P&P. Delivery normally By Return of Post.

Send your Company Order, cheque, Postal Orders, or phone your ACCESS, VISA or B'CARD number to the UK's leading CASIO Specialists:

TEMPUS

Dept PC,
38 Burleigh Street,
Cambridge CB1 1DG.
Tel: 0223 312866.

● Circle No. 299

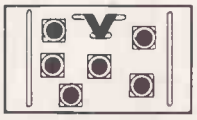
ZX80 ZX81

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX, BN13 3JU
TELEPHONE WORTHING 65691 (Evenings and Weekends only)

NOW ENHANCED

ZX81 — SLALOM (16K RAM PACK REQD.)
Slalom events always draw great crowds to the ski resorts and the T.V. cameras are never far behind. Now the skier on your T.V. screen is directly under your control and his success in negotiating the slalom posts and achieving a fast time relies entirely on your skill with the ZX81 keys.



NOW ENHANCED

ZX81 — BLACK HOLES (16K RAM PACK REQD.)
Your starship is in an unknown galaxy consisting entirely of black holes which continually threaten to swallow you. Your skill at the controls and your ability to look and think many moves ahead is the only thing that stands between you and destruction. How long can you survive?

BOTH programs on one cassette £4.95

NEW — An ESSENTIAL addition to your 1K RAM ZX81 (or ZX80 8K ROM)
TOOLKIT (written by PAUL HOLMES)

Provides the following additional facilities:

Line renumber — you state starting number and increment value.
Search and replace — changes every occurence of a character as you require.
Free space — tells you how many free bytes you have left.

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode — graphics never seen on a ZX81 before.
Open — instantly sets up as many empty print lines as you require.
Fill — used in conjunction with OPEN fills your screen instantly with your specified character.
Reverse — changes each character on your screen to its inverse video.

TAPE ROUTINE — provides a system WAIT condition until a signal is received in the cassette ear jack — many uses!

All these routines are written in machine code and together take up only 164 BYTES of your precious RAM — an incredible achievement!!

The price is incredible too! ONLY **£3.95** for cassette, including FULL instructions and example programs.

ALSO available 16K version ONLY **£4.95** which includes all the above PLUS:
GOTO's and GOSUB's included in line renumber.
Search for and list every line containing specified character.

ZX80 — PROGRAMMABLE MOVING DISPLAY (4K-ROM only) NOW ONLY £3.95
Cassette with 1K, 2K versions and 3 example programs plus FULL documentation

16K RAM pack
black case, fully tested and guaranteed
(please allow 14 days for delivery)
Full refund if not delighted.

WHY PAY MORE!

£35

OVERSEAS CUSTOMERS PLEASE NOTE Payment must be made in Sterling by International Money Order (available at your bank). Please add 50 pence to cover overseas postage. (£2 RAM pack).

● Circle No. 300

6809 is HERE!

HARDWARE
SWPTC.

We are agents for South West Technical Products, with their superb range of '6809' based single and multi user business systems. The range includes terminals, 5¼ & 8 inch floppy drives, 20 and 40 Megabyte 'Winchester' hard disks, as well as dual serial and parallel ports. Memory expansion is available in 64K or 128K blocks.

'77—68'

Sole distributor for the original hobbyist's '6800' system. Now based upon either the '6800' or '6809', the '77—68' system is available in kit form and can be expanded from a single board to a 56K '6809' Disk based system, running FLEX, with serial and parallel interface ports.

APPLE.

Appointed APPLE distributors, we have available the full range of APPLE products, all at competitive prices, plus many additional boards and peripherals, including 'The Mill', the '6809' softcard for APPLE II at £279.00.

SOFTWARE
SWTPC.

Full range of South West Technical Products software available, including system software for FLEX and UNIFLEX systems.

For those of you wishing to convert your existing '6809' disk system to FLEX, we have General FLEX available, complete with adaptation guide, editor and assembler to suit most systems, price £120.00.

CASSETTE SOFTWARE

Suitable for '6800' or '6809' systems, we can supply a range of cassette or disk based 'Basics', as well as cassette based editor and assembler for 6800 systems. Prices from £17.25.

BUSINESS SOFTWARE

For the APPLE II, we have available 'Visicalc'. This is the famous planning and forcasting tool invaluable to any business. Price £125.00.

For '6809' users a new package has just been released which provides a similar function to 'Visicalc', but which runs under FLEX. It is called 'TABULA RASA', and is available on either 5¼ or 8 inch disk. Price £139.00.

- **Come in and try out any of these systems, or use our Mail Order service.**
- **All prices correct at time of going to press & include VAT at the current rate.**
- **Send for our latest catalogue and price list. Access and Visa accepted.**
- **Store Opening Hours, Monday to Saturday, 9.30 to 5.30.**

STRING MICROSYSTEMS

241 Baker Street, London NW1 6XE. Telephone: 01-486 7671.

● Circle No. 301

NEC turns 27 years of computer experience to your personal advantage.

It takes a great computer company to make a great personal computer. And from the start, NEC has been a pioneer in computer technology. In fact, we invented the all-semiconductor computer in 1959. Now, hundreds of innovations later, we've made it personal.

We present the PC-8000, a powerful and friendly business tool that can help you get more done in a day than you ever could before. It combines some of the most reliable hardware on the market with application packages designed to make the most of its unique features. In addition, the PC-8000 accepts popular CP/M business software, making its possibilities virtually limitless.

The entire PC-8000 system is now available through better computer dealers across the country. And that means more than hardware. It means effective software, the finest documentation and extensive training to help you get the most from your personal computer. So why not turn our system to your personal advantage now.

NEC
Nippon Electric Co. Ltd

NEC Telecommunications Europe Co Limited
NEC House, 164/166 Drummond Street,
London NW1 3HP UK
Telephone: 01-388-6100 Telex: 261914

IBR Microcomputers (England/Wales Distributor) Sutton Park, London Road,
Reading, Berkshire
Telephone: (0734) 664111 Telex: 848215

● Circle No. 302

PROTECT YOUR SOFTWARE INVESTMENT

APPLE®
COPY II PLUS – the newest and fastest bit-copier
version 3.0

Apple Copy II Plus gives you the power to make back-up copies of nearly all the "protected" software packages currently available. Several thousand Apple users have already recouped their investment many times over with Copy II Plus.

RELAX
With the Apple Copy II Plus in your top drawer you can stop worrying about accidental damage to your valuable diskettes. The Copy II Plus allows you to make back-up copies for normal use, so you can keep your originals safely locked away – away from the dangers of spills or stray magnetic fields, or just the wear and tear of everyday usage.

EXTREMELY VERSATILE
Version 3.0 of Copy II Plus is an advanced bit-copier which can defeat nearly every protection system now in use. It will copy most DOS 3.2 and 3.3 diskettes including:
Visicalc 3.3, Desk Top Plan, Magic Window, DB Master (2.4) Dataplan, the Apple Special Delivery Software range and many, many more.

UNIQUE
- Copy II Plus is the *only* bit-copier that allows you to make back-up copies of itself – for complete peace of mind.
- Copy II Plus is the fastest bit-copier by far. It copies 5 tracks at a time and makes a complete disk copy in only 35 seconds, while ordinary bit copiers take 5–7 minutes!

FEATURES
- easy to use menu.
- comprehensive instructions.
- copy with 1 or 2 drives.
- track-by-track copy program report.
- copies half-track and irregular track spacing.
- variable search parameters – for non-standard sync or header nibbles.
- "display" option shows data being copied.
- "examine buffer" option helps identification of protection system used.

HOW TO GET YOUR COPY II PLUS
Copy II Plus needs 48K DOS 3.3, and at least one disk drive.

Send £45.00 + VAT to:-
Apple Orchard Ltd
7a Church Lane
Loughton
Milton Keynes MK8 0AS
or: Phone 0908 53595 and quote your Access or Diners Club card to our 24 hour answerphone.
Please allow 7–14 days for delivery – or tell us to rush if that's too long.

apple orchard

Access

Apple is a registered trademark of Apple Computer Inc.
Desk Top Plan and Visicalc are registered trademarks of Personal Software Computer Systems.
Dataplan is a registered trademark of Evesham Ltd.
Magic Window is a registered trademark of Artsci Ltd.
DB Master is a registered trademark of Stoneware Micro Computer Products Inc.
Copyright Apple Orchard Ltd. 1981

TESTED & ASSEMBLED PCB'S & KITS
6 MONTH GUARANTEE — REPAIR SERVICE

Z80A COMP

FULCRUM COMPUTER PRODUCTS

I-8080 S-100 ENCLOSURE SHEET METAL KIT
Just like THE ORIGINAL IMSAI: Mainframe with blue cover, cardguides and hardware spaced for PS-28D Power Supply, up to 20 slot motherboard.
Kit of all metal parts and hardware with documentation £90.14
Thinker Toys Wunder Buss 20 for above w/o conn. £74.00
S-100 Connectors—*each* £3.60
8015 Blank jump-start panel w/3 switches £36.57
8035 Jump-start panel for 2 SA-400 . . . . . £74.00

PS-28D POWER SUPPLY PARTS KIT
Mounts in the I-8080 enclosure, supplies + 8V @ 28A, +/– 16V @ 3A, kit includes board, transformer, documentation, and all components. Improved from original.
Kit £149.00

PIO 4-4
4 parallel inputs and outputs (8212) £147.00

SIO 2-2
2 serial I/O ports, good to 9600 baud £147.00

VIO-F
Improved memory mapped video I/O board, includes keyboard port, 256 character EPROM's, firmware, monitor.
Assembled and Tested £249.00

DIOC or D
2 board disk controller for 8" or 5¼" £278.00

CPM® 2.2
For DIO including documentation £125.00

CPA
Improved Imsai style front panel works with Z80, etc. £212.75

MPU-A
8080 processor board—requires CPA £117.00

MPU-B
8085 3MHz processor S8C w/serial plus parallel port, monitor £221.00

RAM III 64K MEMORY
64K byte dynamic RAM board—Utilizes the Intel 3242 refresh controller and a single delay line for totally internal refresh. Uses time proven 4116 RAMS. Memory mapped I/O boards are allowed to coexist by the use of phantom. Board select via A16 thru A20 extended address lines.
Assembled & Tested £265.00

IKB-1
Intelligent keyboard uses 8035 . . . . . £155.00

VIO-X
New port mapped video I/O board w/8085 processor, 8275 CRT controller, keyboard port, firmware.
Assembled & Tested £234.00

IEEE 488 + 3P
New IEEE-488 I/O interface with 3 parallel ports.
Assembled & Tested £398.00

Z80 PIGGYBACK
Adaptor board for 80/85 conversion £94.00

Fulcrum (Europe), Valley House, Purleigh, Essex, England
Send for free brochure & details of our special disk drive offers.
World-wide agents required.

FULCRUM SYSTEMS

ONLY £3,095 + VAT

The 8025 Business System gives you:
- Choice of Terminal or Monitor
- 2.4 Mb Storage
- 64k RAM
- 2 x 8" Disk Drives
- CPM 2.2
- Complete range of Software offered

ALL PRICES PLUS VAT

I-8080 SYSTEM: The basic 8080 based S-100 system. Includes CPA front panel, 20 slot 10 MHz motherboard (with all 20 connectors), MPU-A 8080 CPU board, PS-28D power supply (+ 8V @ 28A, +/– 16V @ 3A), and chassis.
Assembled & Tested with MPU-A £702.00

I-8015 BASIC SYSTEM: The complete 8085 system, includes MPU-B, 64K RAM 10 slot terminated motherboard. PS-28D and jump-start front panel.
Assembled & Tested £1064.00

I-8025 COMPLETE BUSINESS SYSTEM: Includes I-8015 system and DS-8 disk system w/CPM 2.2.
Assembled & Tested
1 2 M byte 8" drive £2501.00
2 4 M byte 8" drive £3095.00

I-8035: The 8085 computer system with twin 5¼" disk drives, DIO-D, MPU-b, 64K RAM chassis, 10 slot motherboard and power supply. Includes CPM® 2.2
180K store £1890.00
360K store £2050.00
780K store £2316.00

"D" SERIES ENCLOSURE For 8" Rack Mount Drives (Horizontal)
Enclosure only (DC-8) £90.15
Enclosure, Power Supply, Cables (DE-8) £221.00
Above with 2 Shugart 800/801 R Drives (DS-8) £1036.66
Above with CP/M® 2.2 and Controller (DT-8) £1362.17

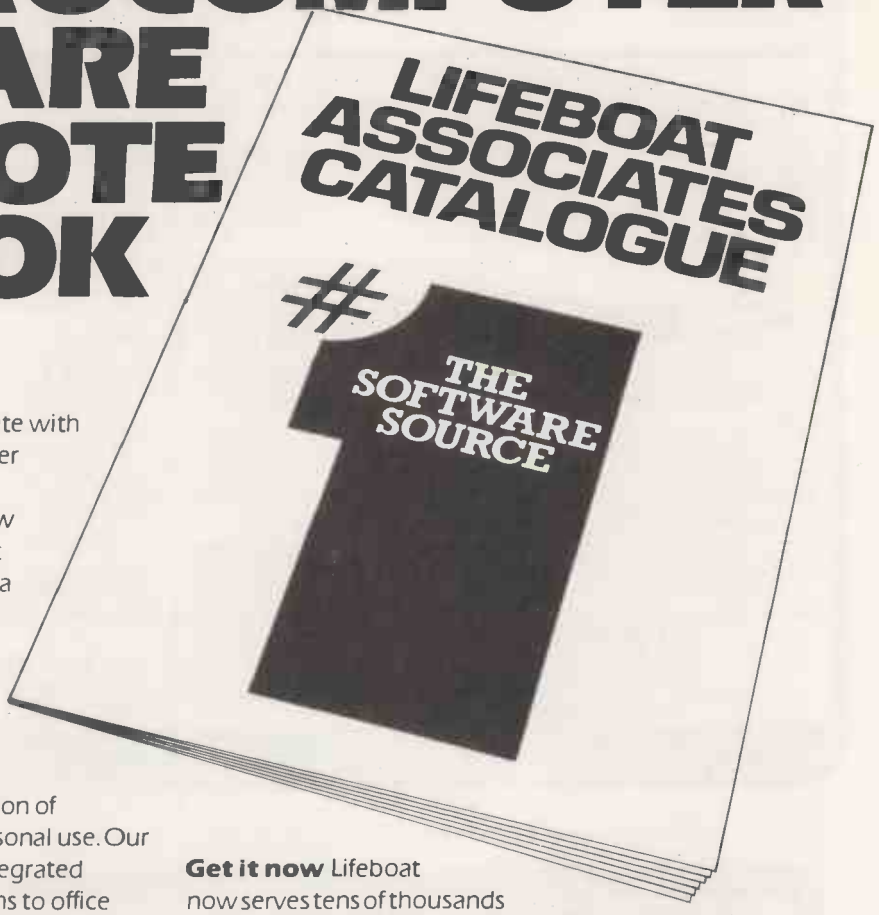
"S" SERIES ENCLOSURE For 8" Standard Mount Drives (vertical)
Enclosure only (SC-8) £90.14
Enclosure, Power Supply, Cables (SE-8) £216.35
Above with 2 Shugart 800/801 Drives (SS-8) £876.00
Above with CP/M® 2.2 and Controller (ST-8) £1171.87

"MDX" SERIES ENCLOSURE For 5" Drives
Enclosure only (MDX-C) £67.60
Enclosure, Power Supply, Cables (MDX-PS) £212.00
Above with 2 Tandon DS, DD Drives (MDX-S) £741.00

RING NOW 0621 828763
Telex: 995411

● Circle No. 303

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



How do you stay up-to-the-minute with the rapidly changing world of microcomputer software? Get the Lifeboat Catalogue.

The latest innovations The new Lifeboat Catalogue is packed with the latest state-of-the-art software. And if we publish a new program after the latest catalogue has gone to press, we enclose a flash bulletin in your copy.

The greatest selection Because Lifeboat is the world's largest publisher of microcomputer software, our catalogue offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from the integrated accounting and professional practice systems to office tools for book-keepers and secretaries to sophisticated tools for programmers. Included are business systems, word processors, programming languages, database management systems, application tools and advanced system utilities.

We specialise in software that runs on most small business computers. Our more than 60 media formats, including floppy disks, data cartridges, magnetic tape and disk cartridges, support well over 100 different types of computer.

Get full service We give the crucial dimension of after-sales service and full support to everything we sell.

That includes:

- An update service for software and documentation.
- Telephone, telex and mail-order services in the London office and at overseas offices in the United States, France, Switzerland, West Germany and Japan.
- Subscriptions to Lifelines,™ the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.

Get it now Lifeboat now serves tens of thousands of satisfied customers with our breadth of up-to-date, fully tested, fully supported and competitively priced software.

You may not need all we offer, but we offer just what you need. After all, we wrote the book.

Lifeboat Associates

World's foremost software source

Mail coupon to: Lifeboat Associates
PO Box 125, London WC2H 9LU or call 01-836 9028

☐ Please send me a free lifeboat catalogue.

Name

Title

Company

Address

Postcode

Copyright © 1981, by Lifeboat Associates.

Lifeboat Worldwide offers you the world's largest library of software. Contact your nearest dealer of Lifeboat.

USA Lifeboat Associates 1651 Third Ave. New York NY 10028 Tel (212) 860-0300 Telex 640693 (LBSOFT NYK) TWX 710 581-2524 **JAPAN** Lifeboat Inc. OK Bldg. 5F 1-2-8 Shiba-Daimon Minato-ku Tokyo 105 Japan Tel 03-437-3901 Telex 2423296 (LBJTYO) **ENGLAND** Lifeboat Associates Ltd PO Box 125 London WC2H 9LU England Tel 01-836 9028 Telex 893709 (LBSOFTG) **SWITZERLAND** Lifeboat Associates GmbH Hinterbergstrasse Postfach 251 6330 Cham Switzerland Tel 042-36-8686 Telex 865265 (MICO CH) **W GERMANY** Intersoft GmbH Schlossgartenweg 5 D-8045 Ismaning W. Germany Tel 089-966-444 Telex 5213643 (ISOFD) **FRANCE** Lifeboat Associates SARL 10 Grande Rue Charles de Gaulle 92600 Asnieres France Tel 1-733-08-04 Telex 250303 (PUBLIC X PARIS)

● Circle No. 304

L & J COMPUTERS

192 HONEYPOT LANE, QUEENSBURY, STANMORE, MIDDX HA7 1EE. 01-204 7525

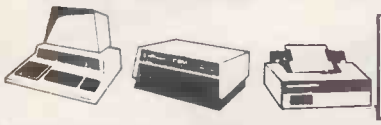
THE "PET" SPECIALISTS

GET THE BEST OF BOTH WORLDS!

WE CAN SUPPLY ALL YOUR 'PET' NEEDS AT CASH & CARRY PRICES

4032	40 Col. PET.	£585.00*	8050	1M Byte Disk	£755.00*
8032	80 Col. PET	£755.00*	4022	Printer	£357.00*
4040	347K Disk	£585.00*	8024	Printer	£975.00*

OR WE CAN SUPPLY, INSTALL AND TRAIN YOUR STAFF AT THE NORMAL PRICE WITHOUT ANY EXTRAS!!



TRY US! YOU WILL NOT BE DISAPPOINTED

EXT CASSETTE DECKS (INC COUNTER & SOUNDBOX) ~~£65~~ **£55***

Printers	Disk Drives	Sundries	
CBM 4022 & 8024	CBM 8050	Interfaces:	C12 Cassettes
Centronic 779	CBM 4040	Disks:	Library Cases
Centronic 737	CBM 3040	Paper	(roll & tractor feed)
Spinwriter 5510		Labels:	Dust covers
CBM 8026 & 8027			

NOW IN STOCK! Single floppy disk drive **£350***

TOOL KITS (BASIC 2 & 4), SUPERCHIPS . . . AND ALL SORTS OF OTHER CHIPS . . . UPGRADE YOUR PET EVEN MORE!!

THE "MUPETs" ARE HERE!
3 TO 8 PETs ONLY NEED 1 DISK DRIVE . . .
Daily demonstrations: Ring for details.

*** PRICES DO NOT INCLUDE VAT**

SOFTWARE

As well as a full range of Petsoft and Commodore Software, we have some highly reliable "Home-Brewed" programs available.

STOCK CONTROL & INVOICING **£60**
(Handles up to 500 items — 32K) (180 on 16K). Stock depleted on invoicing, search etc. Cassette, disk (& print option).

3000 item; 4040/8050 £125

CASH BOOK **£90**
Enter daily/weekly amounts — printout and totals, weekly/monthly analysis, totals and balances.

4032 & 8032 versions **£110 & £120**

STOCK TAKING for the licensing trade **£240**

OUTSIDE SERVICES (For Mini-Cabs etc.) **£220**

Sae for free software booklet

VISICALC "OZZ" Commodore Business Programs
COMPSOFT DMSV Bristol Trader, Item & Monitor
ANAGRAM LEDGERS Superpay Word Processing.

COME AND SEE THE NEW VIC 20 at £189 (inc VAT)

FULLY WORKING AND OPERATIONAL
ASK US ABOUT ALL THE ADD-ON-GOODIES THAT GO WITH THE VIC . . . !

PERSONAL SHOPPERS WELCOME
Phone & Mail Orders accepted.

ALL GOODS SENT SAME DAY WHEREVER POSSIBLE
LARGE S.A.E. FOR LISTS ETC.

● Circle No. 305

THE REVOLUTIONARY TWOSOME

SDM Computer Services are major distributors of the Intertec Superbrain micro computer. This machine has established itself as *the* micro for the serious business user . . . it is not an upgraded hobby system.

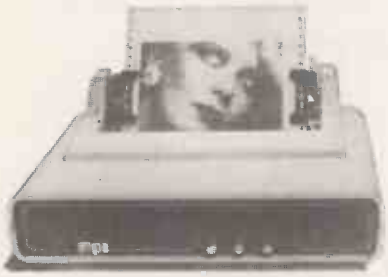
Running, as it does, under the CP/M operating system, there is a wealth of readily available commercial software and SDM have their own tried and tested suite of packages covering:

Invoicing ● Stock ● Sales ledger ● Purchase & Nominal ledgers ● Payroll

All models are available from double density through the 1.5MB system to the (shortly to be announced) Superbrain W6 which includes a 5MB Winchester.

Full software and engineering support when you buy from SDM.

MPI-88G — everything you need



SUPERBRAIN — built for commerce

This printer has more standard facilities than any other at a similar price:

- **RS232 serial *and* Centronics type parallel, 1K byte buffer**
- **Upper and lower case 96 character ASCII set, 100 cps maximum**
- **10, 12, 16.5 cpi and correspondence font**
- **High resolution graphics (vertical 72 dots/inch, horizontal 82 dots/inch)**
- **6 or 8 lines per inch paper feed**
- **Full forms control**

All the above list and others are *standard* at no additional cost.

Whether it is for your Superbrain business system or any other computer with RS232 or Centronics interfaces you cannot find a better printer.

Supplied ex stock for the amazing price of £475 plus VAT and P & P

S.D.M. COMPUTER SERVICES

BROADWAY, BEBINGTON, WIRRAL,
MERSEYSIDE L63 5ND. Tel: 051-608 9365.

SDM

● Circle No. 306

ON THE JOB OR IN THE HOME...

Make The Most Of The Fast-Moving World Of Computers

For an easy and inexpensive way to keep on top of it all . . .

THE COMPUTER BOOK CLUB

Books and Services for the Information Processing World

Why is the Computer Book Club a great source for top-notch books at surprisingly low prices? Here are five good reasons why:

- **Editorial Quality:** Each month you'll find on offer a range of fine books covering a variety of fields of interest, all carefully reviewed and selected by our own team of experts.
- **Big Savings:** In addition to getting your choice of three books for £2.00 each plus p&p*, membership will entitle you to keep on saving—up to 25% (sometimes even more) off on all books.
- **No Pressure to Buy:** You have both real choice and an easy to handle commitment with The Computer Book Club. We'll send you the Club News monthly—describing the latest selections—but you needn't take any particular book or take one book a month. All we ask is that you take at least four books during your first year of membership.
- **Software Services:** We are polling our membership to find out if we can be of further service in supplying software packages. Your thoughts and needs will also be incorporated in our survey.
- **Added Advantages:** You'll be able to read the Club News at your leisure, make your selection from the comfort of home and have the books you select delivered promptly to your door.

Please accept my application and enrol me as a member of The Computer Book Club. Send me the three book choices whose numbers I have indicated below. (Some more expensive books, as shown above, will count as two choices.) You will charge me a total of £6.00 for my introductory books, plus £1.25 towards postage and packing*. If not completely satisfied I may return the books within 10 days, cancel my membership and owe nothing.

As a member my commitment is to buy 4 books in my first year of membership. I do not need to take a book each month. If I want an alternative to the main selection, or no book at all I will tell you so on the form provided. I am over 18 years of age.

Write the codes for your choices here: ____ ____ ____

Mr/Mrs/Miss _____
(please print)

Address _____

_____

_____ **Postcode** _____

Signature _____

SEND NO MONEY NOW/Post to The Computer Book Club, Wiley Dist. Centre, Oldlands Way, Bognor Regis, W. Sussex PO22 9SA

Offer limited to one per household. Allow up to 6 weeks for delivery. The Computer Book Club is a division of John Wiley & Sons Ltd Reg. no. 641132 England

Offer valid only in the UK and Eire. Offer expires May 1, 1982

● **Circle No. 307**

SYSTEMS FOR BUSINESS...

As business system specialists we're able to offer a full range of software adapted to low cost hardware, so even the smallest business can benefit from computerisation at a comparable cost — and as you grow so can your computer system.

Apple II from £1895
Apple III from £2900
Sharp PC3201 from £2895
Commodore 4000 from £1875
Commodore 8000 from £2995
Systime 500 from £7000

Choose from our comprehensive software packages including the widely acclaimed FMS Accounting System, financial modelling, payroll, filing systems and asset register; or take advantage of our software expertise with a package tailor-made for your requirements. Full leasing facilities available including software.

...COMPUTERS FOR PEOPLE

The same expertise we offer to businesses is also available to our home computer customers. You can select from our range of hardware, accessories, games, books and educational programs — and we'll demonstrate any system before you purchase.

*** VIC 20 COLOUR COMPUTER**
3½K user memory
24 colour variations
3 x 3 octave sound voices
4 programmable function keys

PLUS — games cartridges; extra RAM packs: 3K, 8K, 16K; light pen; games paddles; printer; disk drive

*** SHARP MZ80K COMPUTER**
48K memory
3 octave sound range
Multiple graphic character set

INCLUDES — keyboard, screen with 40 characters & 24 lines, and cassette unit with tape counter.

PLUS — printers, disk drives, interface cards and choice of BASIC, FORTH, PASCAL, ASSEMBLER or MACHINE CODE.

2 year guarantee on most products
Ring for current prices!

COD SERVICE AVAILABLE — ring for details

OPEN MONDAY — SATURDAY
9.00 am to 5.30 pm

INSTANT CREDIT UP TO £1,000!

RAM COMPUTER SERVICES LTD
15-17 North Parade BRADFORD BD1 3JL
Tel (0274) 391166

● Circle No. 308

MICRO PRICES SLASHED!

APPLE	£	PET	£
48K Apple Europlus	582	2001 8K Pet	366
16 sec Disk Drive with controller	284	3032 32K Pet	599
		3040 Disk Drive	599
Disk Drive without controller	223	3022 Printer	366
		8032 80 col 32K Pet	772
Silent type printer	200		
Graphics tablet	329		
Hitachi 9" screen	89		
BMC 12" green screen	118		

Add 15% V.A.T. and £5 for carriage. Allow up to 21 days for delivery.
CASH OR CHEQUE WITH ORDER.

MICRO MEDIA
1 VINE COTTAGE, TENTELOW LANE
NORWOOD GREEN, MIDDLESEX. UB2 4LG
TELEPHONE: 01 843 9457

● Circle No. 309

PHOTO ACOUSTICS LTD

THE ONE STOP COMPUTER SHOP—

VIC 20 computer	£189.95	CBM 8032	£875.00
Expansion box	£97.95	CBM 8050	£875.00
3K RAM packs	£29.95	CBM 8026	£1,006.00
8K RAM pack	£44.95	CBM 4032	£690.00
16K RAM pack	£74.95	CBM 4040	£690.00
Joysticks	£10.00	CBM 4022	£399.00
C2N cassette deck	£44.95		

These prices are Cash and Carry. Ring Dick at Watford for quote.

★★ *Software Available* ★★

Apple II computer	£784.00	Genie I computer	(Ring for quote)
Disc drive + cont.	£384.00		
Disc drive without	£301.00	EG3014 Expansion	£228.00
Eurocolor card	£70.00	EG3013 Expansion	£234.00
9" Hi-res B/W monitor	£99.00	EG3013/W Expansion	£264.00
9" Hi-res green monitor	£110.00	EG400 disk drive	£243.00
12" B/W monitor	£79.00	12" B/W monitor	£79.00
12" green monitor	£87.00	12" green monitor	£87.00

★★ *Games software avail.* ★★ | ★★ *Software avail.* ★★

58, High Street
Newport Pagnell
Bucks.
Tel: 0908 610625

255a St. Albans Road,
Watford, Herts.
(entrance in Judge Street)
Tel: 0923 32006

MAIL ORDER
CREDIT CHARGE

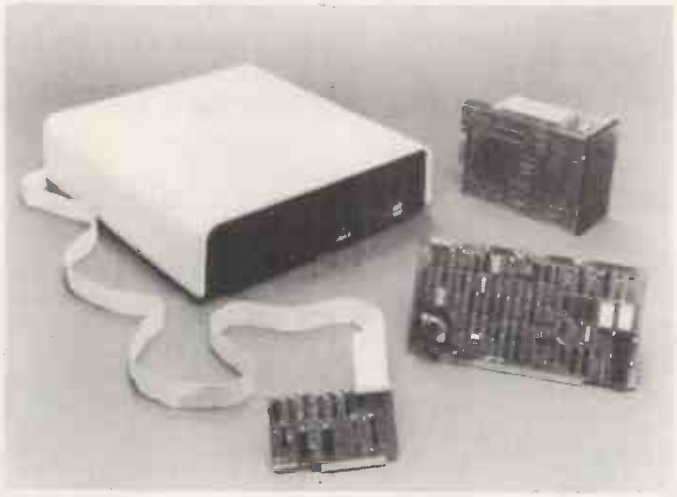
● Circle No. 310

INDEPENDENT COMPUTER ENGINEERING LTD

A BRITISH 5¼" WINCHESTER DISK DRIVE

INTERFACE-COMPATIBLE WITH YOUR MICROCOMPUTER

★ 3.14, 6.28, 9.42, 12.56 MEGABYTE CAPACITIES
★ FAST ACCESS TIMES
★ OPTIMISED SEEK TIMES
★ ON-BOARD MICROPROCESSOR CONTROLS DRIVE OPERATION AND PRO-PROVIDES DRIVE DIAGNOSTICS



THE ICE WINCHESTER SUBSYSTEM COMPRISES:

★ Winchester Drive/s **(RODIME),** Controller, Cables, cabinet and Software to support your system.
★ Subsystem can be enhanced to provide 2 Winchester drives, or Winchester plus floppy disk drive.
★ Your BACK-UP problem solved with 20 Megabyte Streamer Tape Subsystem.
★ Whisper Quiet Operation.

★ **APPLE, S100 BUS, IBM PERSONAL COMPUTER, XEROX 820, SUPERBRAIN, DIRECT 280 CONNECTION.** Call us with **YOUR** Interface problems.

ALL SALES ENQUIRIES TO: Ashford (STD 07842) 47271 or 47171

ICE - INDEPENDENT COMPUTER ENGINEERING LIMITED.

16/18 LITTLETON ROAD, ASHFORD, MIDDLESEX TW15 1UQ. TELEX 8952042

● **Circle No. 311**

WHY BUY FROM CAMDEN?

★ WE SUPPLY : THE **HARDWARE**

★ WE SUPPLY : THE **SOFTWARE**

★ WE SUPPLY : THE **BACK-UP**

★ WE SUPPLY : THE **EXPERIENCE**

★ WE SUPPLY : THE **KNOWLEDGE**

MAIN DISTRIBUTORS FOR ALL THE LEADING MAKES OF MICROCOMPUTERS AND PERIPHERALS.

OFF THE SHELF PROGRAMS TO SUIT MOST APPLICATIONS FROM THE LEADING SOFTWARE HOUSES — WITH PROVEN RELIABILITY.

FROM OUR OWN ENGINEERING WORKSHOPS WITH FULLY QUALIFIED TECHNICIANS OR ON-SITE SERVICE — YOUR CHOICE.

AS ONE OF THE COUNTRY'S LEADING DISTRIBUTORS WITH PROVEN SALES RECORDS — AND ONE OF THE PIONEERS OF THE MICROCHIP.

OUR FULLY TRAINED STAFF WILL ADVISE ON YOUR REQUIREMENTS TO SUIT YOUR NEEDS AND IMPROVE YOUR BUSINESS.

Superbrain

64K QD MODEL
PLUS EPSON MX80FT
PLUS FULLY INTEGRATED
ACCOUNTS PACKAGE
£21 *PER WEEK LEASE OR PURCHASE*

Apple III

128K MODEL
INCLUDES MONITOR
VISICALC III — SOS
MAIL LIST MANAGER
AND APPLE BUSINESS BASIC
PLUS SILENTYPE PRINTER
PLUS ADDITIONAL DISK DRIVE
£21 *PER WEEK LEASE OR PURCHASE*

CAMDEN ELECTRONICS LTD (SYSTEMS DIVISION)

462 COVENTRY ROAD, SMALL HEATH, BIRMINGHAM B10 0UG

PHONE: 021-773 8240 — 021-772 5718.
TELEX: 335909 (CAMDEN G)

● Circle No. 312

microware
London Ltd.

SUPERBRAIN

Models DD. QD. DT HD. **64K** from 320K to 6Mb
at **Low Low prices** from **£1599.00**
True decenders. Graphics.
Parallel port for printers &
Hard Disk also available.

SOFTWARE

WORDSTAR at £195.00
Mail Merge. Data Star. Data Base.
Solicitors' accounts.
Accounting packages.
(Sales. Nominal purchases.
Payrole. Stock control. VAT reports.)
Any popular software supplied.

PRINTERS

MX 80 & 100s from **£275.00**

NEC, TEC & OLYMPIA SCRIPTA
Letter quality printers From **£645.00**

Full range available

DISK STORAGE

File and protect your disks
40 disk system at **£14.95**
80 disk system at **£19.95**
5.25" & 8" available
Carrying handle & security lock
Indexing systems from **£1.50**

LOW LOW LOW PRICES

open 7 days
Mail Order
Dealers enquiries Welcomed.
PHONE 01-346 8452

PROTECT

And enhance your
MICROs
PRINTERS
V.D.U.s
With Microware &
Cover Craft Dust Covers from **£6.95**

DISK DRIVES

Double density. single & double sided drives with power supply & enclosure
5.25" single unit at **£175.00**
5.25" dual unit at **£295.00**
double tracking. 5 & 10 Mbyte Hard Disks & 8" Drives available at **Low Low prices.**

ACCESSORIES

For Printers
Thimbles. Daisy Wheels.
Multi-coloured Ribbons.
at Low Low Low Prices.
For most models.
Also Listing Paper.

Terms: P&P £1.00 media.
Please add 15% VAT to total payment.

MEMOREX DISKS

5.25" Single sided single density **£1.59** each
5.25" Double sided double density **£1.99** each

8" and **Full range available** including **WABASH & DYSAN**

Microware (London) Ltd.. 5 Western Court. Huntly Drive. London N3 1NX

● Circle No. 313

The capability that made Zenith No:1 in the U.S.A., is taking us to the top in the U.K.

Zenith Data Systems didn't get to be the No:1 supplier of CP/M® compatible micro-computers in the U.S.A. on product alone.

Zenith have the hardware for every application of low-cost micro-computers. Systems that can be expanded to 10MBytes on Winchester disk. Peripherals that can meet all input/output requirements. International Standard interfaces that support the input/output devices.

The world standard CP/M® will support your application – be it business, technical, office administration or word processing.

And with the massive backing of our parent company – the multi-million Zenith Radio Corporation of America – we are not only able to improve and develop our products, but to expand our market continually throughout the world. This includes an extensive investment programme for Zenith in the United Kingdom.

With this kind of backing we're going places. So whether you're a dealer, end-user or OEM – Invest in Zenith Technology today and come with us.

It's a solid investment you can afford.

*CP/M is the registered trademark of Digital Research.

Please tell me more about your micro-computer systems:-

NAME POSITION

COMPANY ADDRESS

TELEPHONE

ZENITH data systems

The quality goes in before the name goes on.

Zenith Data Systems, Bristol Road, Gloucester GL2 6EE. Tel 0452 29451.

● **Circle No. 314**

COMPUTER 100 LIMITED

SHARP MZ80K

SPECIAL OFFER

INCLUDING Basic Tape and Programming Manual

All units are fully upgraded and tested before leaving our workshops.

£375 inc VAT

The MZ80K is complete with 48K RAM, and the V.D.U. and cassette are not expensive extras.

Price is inclusive of VAT at current rate of 15%
Add £7.50 carriage/insurance to Mail Orders

COMPUTER 100 LIMITED

7 Southcote Parade
Southcote Farm Lane
Southcote, Reading RG3 3D7
Reading (0734) 584545

● Circle No. 315

SUPERBRAIN® SOFTWARE

LINTEX PRODUCTS
present
LINDATA™

This flexible program is vocabulary based.
It was designed with ordinary business people in mind and uses YOUR names for file areas and YOUR file architectures.
Using prompts in plain English, Lindata™ allows you to:

- ★ Sort a file numerically or alphabetically
- ★ Create file entries
- ★ Print out files in a number of formats
- ★ Alter or use field arithmetics
- ★ Edit a file on a constant keyed input

£75 + VAT including disk, comprehensive manual, packing & UK postage.
Other CP/M™ machines by arrangement

LINTEX PRODUCTS LIMITED

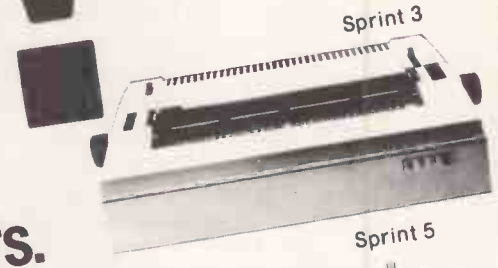
16 Suffolk Road, Potters Bar, Herts EN6 3EZ Telephone Potters Bar (0707) 52834

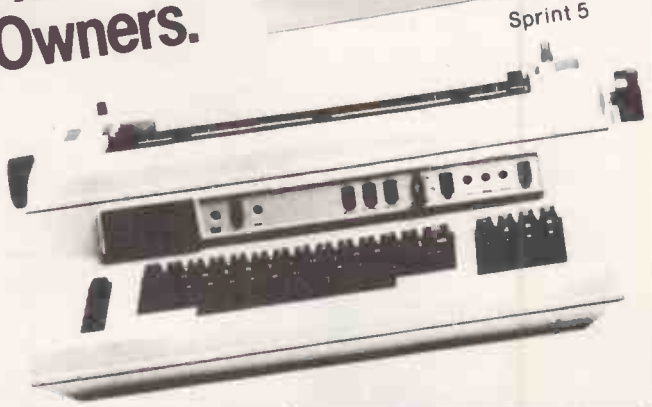
Regular demonstrations but ONLY by appointment

● Circle No. 316

NOW!

The Cossor Fast Repair Service is available to Sprint Printer Owners.





Cossor Electronics has been appointed as a National Service Agent by the Qume Corporation, so all owners of the 'Sprint' range of printers can now take advantage of our unrivalled test and repair service.

Our world-wide reputation for high quality products means that all our repair work is done to the highest standard (MOD Defence Standard 0521, in fact). Additionally, we have insurance cover for the time your equipment is in our hands. So, this is a service you can trust.

Just as important, our service is fast. Usually we turn round PCB's within seven working days from receipt, but in emergencies we can repair single boards within 48 hours.

So if you own a Sprint 3 or 5 printer and you want to discuss service just telephone Henry Lassman on Harlow (0279) 26862. We know we can help.

Cossor Electronics Limited, Service Division,
The Pinnacles, Elizabeth Way,
Harlow, Essex CM19 5BB.

cossor electronics
Thinking for tomorrow

Qume® [U.K.] AUTHORISED SERVICE AGENT

● Circle No. 317

nascom

- ★ **Housed in strong, stylish case with high quality QWERTY keyboard.**
- ★ **0.7Mbyte floppy disc system available in matching case.**
- ★ **Full 8K RAM, expandable to 200K with page mode and RAM boards.**
- ★ **Factory-built options plus additional range of Nascom-approved hardware and software.**

Think of Nascom 3 as an advanced personal computer, built to professional standards and offering the total systems versatility needed by enthusiasts whose imaginations are already ahead of the toy computer field.

Think of Nascom 3 as the powerful heart of a truly versatile educational or business computer system, with added peripherals and an extensive range of firmware and software options.

Or think of Nascom 3 as a custom-structured industrial control unit, well capable of cutting production costs in many key areas.

Nascom 3; reliable, expandable, affordable – and backed by one of Britain's best known engineering groups. Think about it.

OTHER NASCOM PRODUCTS

- ★ Nascom 1 from £125 + VAT
- ★ Nascom 2 from £225 + VAT
- ★ Memory Extension Unit from £80 + VAT
- ★ Disc systems from £375 + VAT
- ★ Input/Output board from £37 + VAT

NEW

- ★ Advanced video controller from £155 + VAT
- ★ Enhanced BASIC from £40 + VAT
- ★ Pascal compiler from £45 + VAT
- ★ Compiled BASIC from £150 + VAT

SPECIAL OFFER IMP PRINTERS £109 + VAT WHILE STOCKS LAST

NASCOM DEALERS

UK

Bits & PCs
Wetherby 0937 63774

Business & Leisure Microcomputers
Kenilworth 0926 512127

CIEL
Edinburgh 031 337 5611

Crystal Electronics
Torquay 0803 22699

Electrovalue Ltd
Egham 0784 33603
Manchester 061 432 4945

Eley Electronics
Leicester 0533 871522

Henry's Radio
London 01 402 6822

Hoftain Ltd
Crymych 02397 9656

Interface Components Ltd
Amersham 02403 22307

JPS
Huntingdon 0487 840710

Leeds Computer Centre
Leeds

Micro Comms
Aberdeen 0224 633385

Micro Print
Stoke-on-Trent 0782 48348

Midshire's Computer Centre
Crewe 0270 211086

Off Records
London 01 674 1205

Parkstone Electronics
Poole 0202 746555

Semicomps Northern Ltd
Kelso 0573 243666

Skytronics
Nottingham 0602 45053

SRS Microsystems
London 01 363 8060

Steve's Electronic Supply Co
Cardiff 0222 41905

System Electronics
Brighton 0273 26081

Target Electronics
Bristol 0272 421196

Trading Post
Hastings 0424 437875

Zeta Computers
Stonehouse 045 382 2444

OVERSEAS

Semicaps APS
Copenhagen 221510 (Denmark)

JCS Compsants
Paris 265 42 62 (France)

MK-Systemtechnik
Germersheim 7274 2756 (Germany)

MAAS Computer Consultants
Bunde (L) 43 64 11 47 (Netherlands)

Microcomp AB
Uppsala 1300 70 (Sweden)

SW Instruments
Helsinki 738 265 (Finland)

Lucas Logic

● **Circle No. 318**

We have the technology to make your business more efficient.

Come to a free seminar at
The LONDON MICRO CENTRE and find out what a micro processor can do for you.

See what our business programs do – and try them out yourself.

At our seminar, you can ask any question you like and get an answer you can understand.

Seminars are held every Wednesday and Saturday from 10.30 am till noon at

The LONDON MICRO CENTRE
47 Lower Belgrave Street
LONDON SW1
Telephone 01-730 8791

Contact us today for further information

Open evenings and weekends.

The LONDON MICRO CENTRE Ltd. – An EMG Company

● Circle No. 319

HOW WOULD YOU LIKE YOUR TO LOOK LIKE THIS ? ZX81

IT COULD WITH THE CROFTON ZX81 ADAPTAKIT.

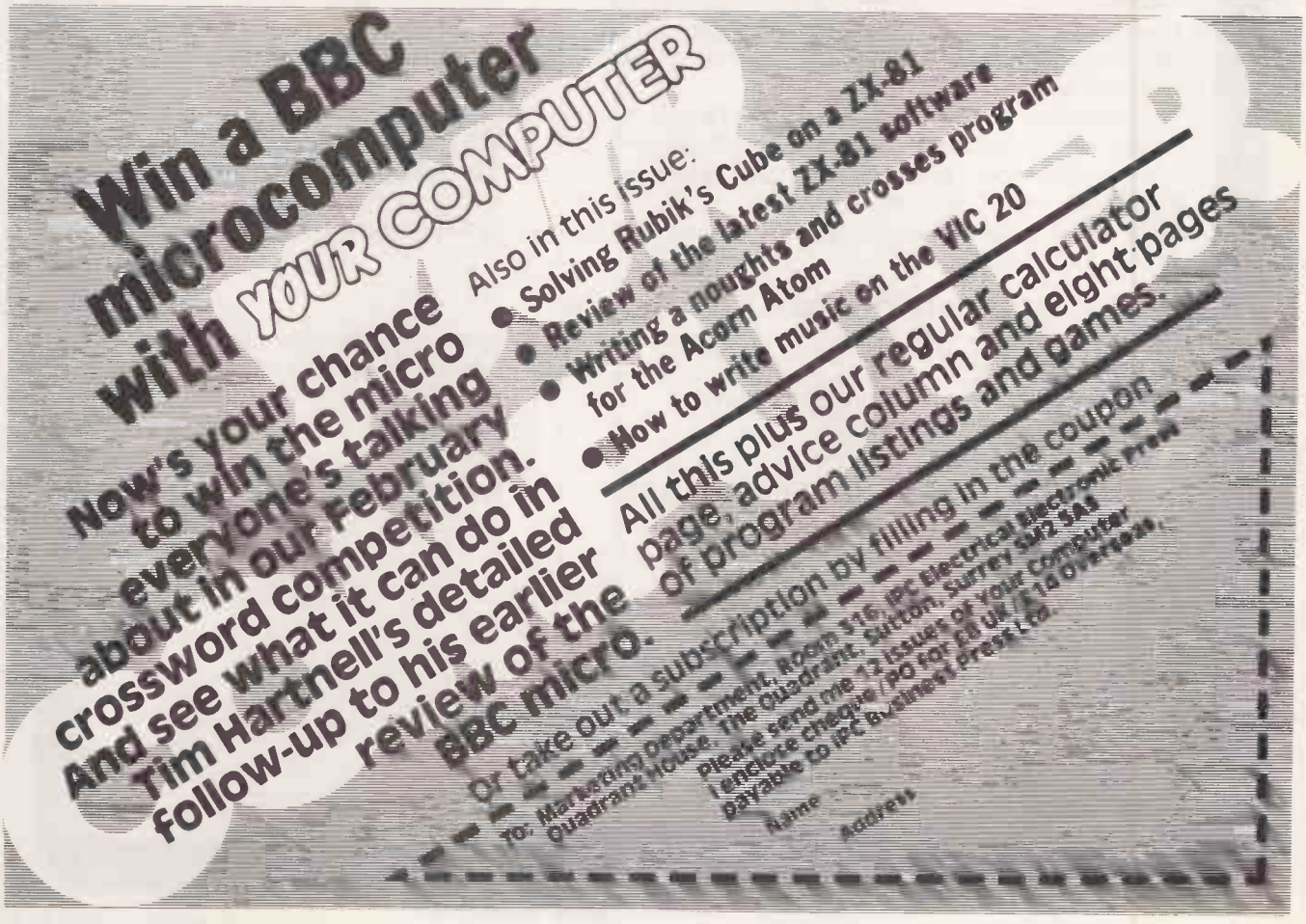
ONLY £35.00 plus VAT - total £40.25 plus £2.45 P&P. AND IT ALSO HAS A VIDEO OUTPUT TO DRIVE A STANDARD MONITOR.

SEND FOR DETAILS.

CROFTON ELECTRONICS LIMITED

35 Grosvenor Road, Twickenham. Middlesex TW1 4AD. Tel: 01.891 1923/1513

● Circle No. 320



COLUMBIA ~ a complete range of microcomputers from 320K ~ 80M

Single and multi-user upgradeable/expandable microcomputer systems from Columbia Data Systems offer the disk storage capacity that's exactly right for you. Single user machines to take 5¼" or 8" floppy disks giving 320K-2.4M capacity and multi-user machines with up to 80M on hard disk. Up to 5 users can work on different programs simultaneously while sharing a single processing system. Ideal for word processing, general accounting or other special purpose business applications.

Icarus handle the whole range of microcomputer systems produced by Columbia Data Systems of the U.S.A. This includes CP/M and MP/M single and multi-terminal units with hard and floppy disk storage capacities. It is adaptable to suit each and every micro-based application there is. So whenever you need a microcomputer, for whatever purpose, Columbia and Icarus have the answer.

The Icarus dealer network

ABRAXAS COMPUTER EMPLOYMENT, 357 Euston Road, LONDON NW1 3AL. Tel: 01 388 2061

A.P. LTD, Maple House, Mortlake Crescent, CHESTER CH3 5UR. Tel: 0244 46024

AMCO LTD, Playfair Road, LEEDS LS10 2GP. Tel: 0532 708321

BUSINESS INFORMATION SYSTEMS, 602 Triumph House, 189 Regent Street, LONDON. Tel: 01 437 1069

BORDER COMPUTING LTD, Dog Kennel Lane, BUCKNELL, Shropshire. Tel: 054 74 368

CAMBRIDGE MICRO COMPUTERS, Cambridge Science Park, Milton Road, CAMBRIDGE. Tel: 0223 314666

COMMONSENSE COMPUTING LTD, P.O. Box 7, BIDEFORD, Devon. Tel: 02372 4795

CONQUEST COMPUTER SALES LTD, 92 London Road, BENFLEET, Essex. Tel: 03745 59861

CULLOVILLE LTD, Thornfield, Woodhill Road, SANDON, Chelmsford, Essex. Tel: 024 541 3919

DATA WARE, 48 Ea..on Drive, KINGSTON, Surrey KT2 7QX. Tel: 01 546 2984

DAYTA, 20b West Street, Wilton, SALISBURY, Wilts. Tel: 0722 74 3898

DRAGON SYSTEMS LTD, 17 Walter Street, SWANSEA, W. Glam. Tel: 0792 749486

DUPLEX COMMUNICATIONS, 2 Leire Lane, Dunton Bassett, Lutterworth, LEICESTERSHIRE. Tel: 0455 209131

EASIBEE COMPUTING LTD, 133/135 High Street, LONDON E6 1HZ. Tel: 01 471 4884

ESCO COMPUTING LTD, 154 Cannongate, EDINBURGH. Tel: 031 557 3937

ESCO COMPUTING LTD, 40a Gower Street, GLASGOW G51 1PH. Tel: 041 427 5497

EFFICIENT BUSINESS SYSTEMS, 9 Clarence Street, BELFAST 1, N. Ireland. Tel: 0232 647 538

EMTEK, 40 South Furzeham Road, BRIXHAM, Devon. Tel: 08045 3566

FARMFAX LTD, 17 Hylton Road, PETERSFIELD, Hants. Tel: 0730 66123

G.T. OFFICE SYSTEMS, 12 Clovelly Road, LONDON W5 5HE. Tel: 01 567 9959

JAEMMA LTD, Unit 24, Lee Bank House, Holloway Head, Lee Bank, BIRMINGHAM. Tel: 021 643 1609

JENNINGS COMPUTER SERVICES, 55/57 Fagley Road, BRADFORD, W. Yorks. Tel: 0274 637867

LONDON COMPUTER CENTRE, 43 Grafton Way, LONDON W1. Tel: 01 388 5721

MICROAGE LTD, 53 Acton Road, LONG EATON, Nottinghamshire. Tel: 06076 64264

MICRO-K, 186 Martin Way, MORDEN, Surrey. Tel: 01 543 1119

MICRO SOLUTION LTD, Park Farm House, Heythrop, CHIPPING NORTON, Oxon. Tel: 0608 3256

NORTHERN COMPUTERS LTD, 128 Walton Road, Stockton Heath, WARRINGTON. Tel: 0925 601683

OMEGA ELECTRIC LTD, Flaxley Mill, Flaxley Road, MITCHELDEAN, Glos. Tel: 045 276 532

RANMOR COMPUTING LTD, Nelson House, 2 Nelson Mews, SOUTHEND-ON-SEA. Tel: 0702 339262

ROGIS SYSTEMS LTD, Keepers Lodge, Frittenden, NR. CRANBROOK, Kent. Tel: 058 080 310

S.D.M. COMPUTER SERVICES, Broadway, BEBINGTON, Merseyside L63 5ND. Tel: 051 608 9365

S.M.G. MICROS, 39 Windmill Street, GRAVESEND, Kent. Tel: 0474 55813

SAPPHIRE SYSTEMS, 19-27 Kents Hill Road, BENFLEET, Essex. Tel: 03745 59756

SHEFFIELD COMPUTER CENTRE, 225 Abbeydale Road, SHEFFIELD S7 1FJ. Tel: 0742 53519

SORTFIELD LTD, E. Floor, Milburn House, Dean Street, NEWCASTLE-UPON-TYNE. Tel: 0632 329593

SPOT COMPUTER SYSTEMS LTD, New Street, Kelham Street Indus. Estate, DONCASTER, S. Yorks. Tel: 0302 25159

STAG TERMINALS LTD, 30 Church Road, Teddington, Middlesex. Tel: 01 943 0777

STUKELEY COMPUTER SERVICES, Barnhill, STAMFORD, Lincs. Tel: 0780 4947

TERMACRE LTD, 126 Woodwarde Road, LONDON SE22 8TU. Tel: 01 693 3037

THAMES VALLEY COMPUTERS, 10 Maple Close, MAIDENHEAD, Berks. Tel: 0628 23532

TURNKEY COMPUTER TECHNIQUE, 23 Calderglen Road, St. Leonards, EAST KILBRIDE. Tel: 03552 39466

THE COMPUTER ROOM, 87 High Street, Tunbridge, Kent. Tel: 0732 355962

WELSH BUSINESS SYSTEMS LTD, 1 Windsor Chambers, Windsor Arcade, PENARTH. Tel: 0222 700059

WING SYSTEMS LTD, 406 Winchester Road, SOUTHAMPTON. Tel: 0703 768338

For further details, or if you want to become a dealer yourself, contact:

ICARUS
Computer Systems Ltd.

Icarus Computer Systems Ltd. Deane House 27 Greenwood Place London NW5 1NN Tel: 01-485 5574 Telex: 264209

● Circle No. 321

ZX-81 OWNERS
ACCESS TO THE OUTSIDE WORLD

Using our programmable **INPUT/OUTPUT** controller based on the Z80AP10, you can use up to 16 programmable input/output lines, all TTL compatible. Control of the port can be carried out from within programmes giving a whole new dimension of uses for your ZX-81 computer.

The port can be used **WITH** or **WITHOUT** the 16K **RAM PACK** & **PRINTER.**

Available in kit form or assembled, and comes complete with instructions, a pack of software notes and circuit ideas.

£10.99 IN KIT FORM
£12.99 ASSEMBLED

ADD 15% VAT & 50p POST & PACKING

Snap on Analogue card and Relay board available shortly. Send SAE for details.

VISA

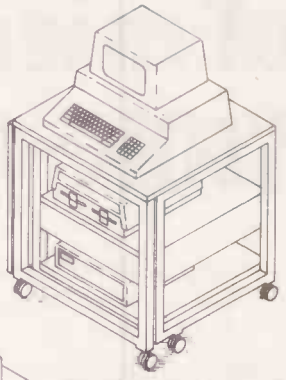
THURNALL (ELECTRONICS) ENG.
DEPT Y, 95 LIVERPOOL ROAD,
CADISHEAD, MANCHESTER M30 5BG
TEL: 061-775 4461 (24 hour)

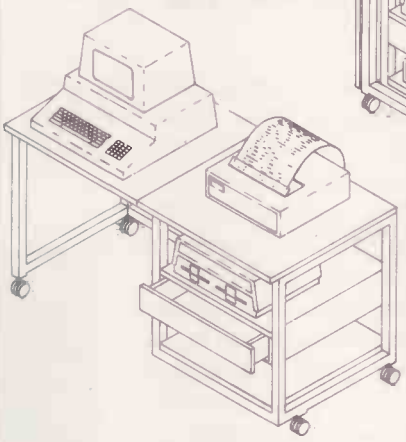
● Circle No. 322

MICRO WORK STATIONS

A new concept in work stations designed to solve space and mobility problems.

A compact storage unit able to house a full system yet only occupying a space just larger than a 60cm square. Even packed away the equipment can still be used effectively.



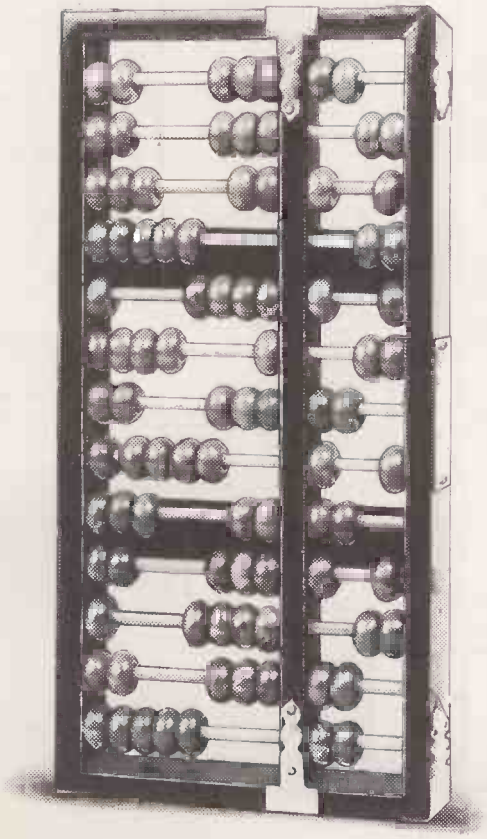


Opening the hinged leaf doubles the work surface area creating an operating position with ample knee and leg room.

Write or phone for full details to :-

Crowther-Cosine,
27, Coleshill Street,
Sutton Coldfield,
West Midlands. TEL:- 021-354 5083

● Circle No. 323



Low Cost

START COMPUTING IN CAMBRIDGE

For less than £100 you can launch yourself into the world of computing with your own system. At Cambridge Computer Store our "Budget Micro" department offers an exceptionally wide range of inexpensive machines, all generally on demonstration, available from stock and fully supported by our enthusiastic staff.

- **Sinclair ZX81**
- **Acorn Atom**
- **Commodore VIC20**
- **Tandy Colour Computer**
- **TRS-80 Model I**
- **Sharp Pocket Computer**
- **Low-cost peripherals**

Make the right start! Visit us at:

Cambridge Computer Store

1 Emmanuel Street, Cambridge CB1 1NE
Telephone (0223) 65334/5

● Circle No. 324

The new Transdata **Cx 502-S SUPERSPEED Microcomputer** offers CP/M performance up to 5 times faster than conventional floppy disc systems. The unique high speed master processor and intelligent disc controller combine to give unrivaled processing power; superior to many Winchester disc based systems.

High Speed Master Processor
The Z80B 6MHz Master Processor gives a 50% increase in throughput over more conventional Z80A systems.

Intelligent Floppy Disc Controller
The Cx 502-S exploits the full power of the FLEXIBUS multi-processor architecture common to all members of the Cx 500 family of Microcomputers. The Z80 based floppy disc controller features a 10Kb full track cache buffer, advanced DMA and automatic error recovery. The twin 8" double-sided double-density disc drives provide 2Mb of storage with software selectable single density for IBM compatibility.

CP/M × 5 = Cx502

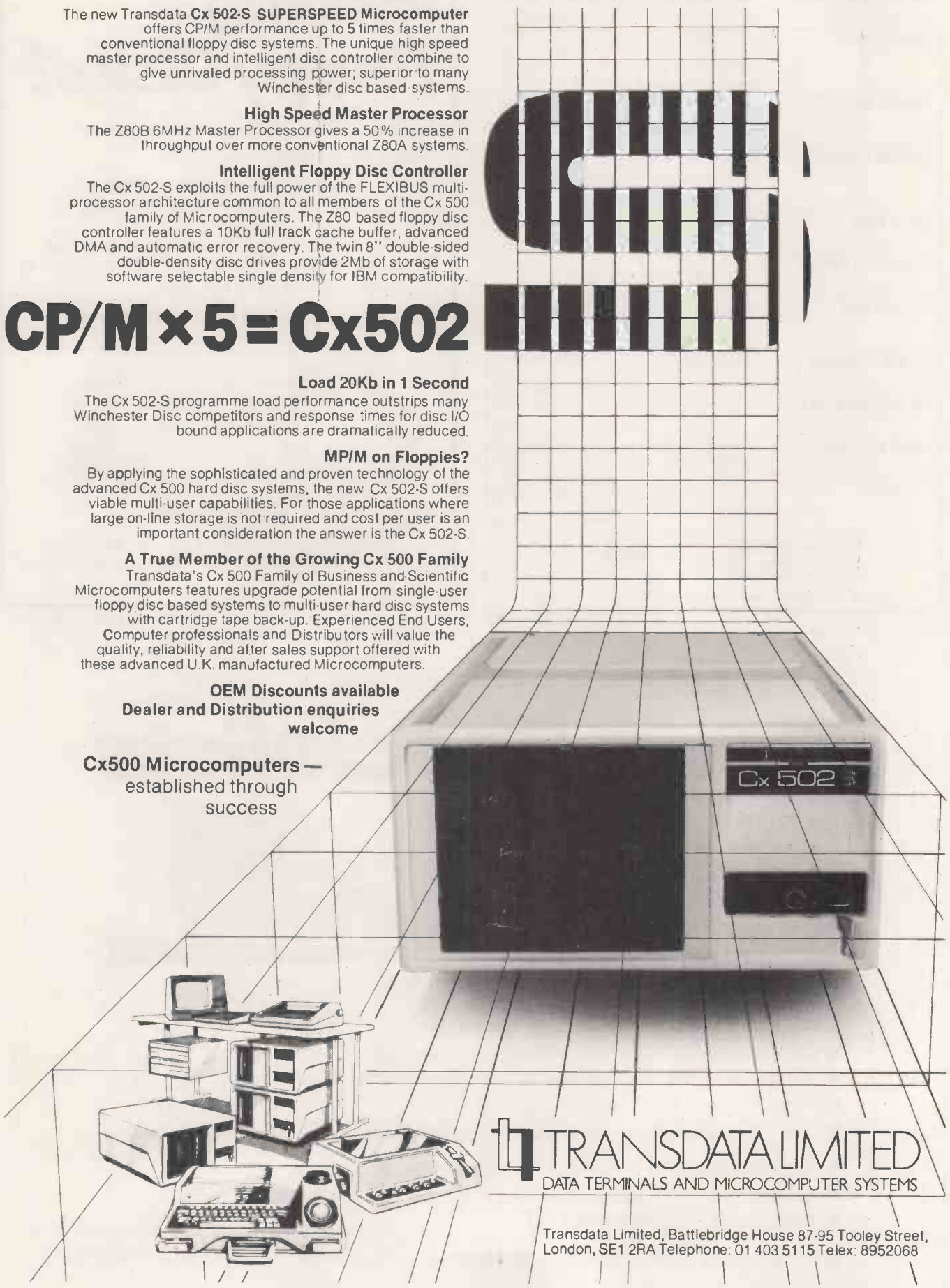
Load 20Kb in 1 Second
The Cx 502-S programme load performance outstrips many Winchester Disc competitors and response times for disc I/O bound applications are dramatically reduced.

MP/M on Floppies?
By applying the sophisticated and proven technology of the advanced Cx 500 hard disc systems, the new Cx 502-S offers viable multi-user capabilities. For those applications where large on-line storage is not required and cost per user is an important consideration the answer is the Cx 502-S.

A True Member of the Growing Cx 500 Family
Transdata's Cx 500 Family of Business and Scientific Microcomputers features upgrade potential from single-user floppy disc based systems to multi-user hard disc systems with cartridge tape back-up. Experienced End Users, Computer professionals and Distributors will value the quality, reliability and after sales support offered with these advanced U.K. manufactured Microcomputers.

OEM Discounts available
Dealer and Distribution enquiries welcome

Cx500 Microcomputers — established through success



TRANSDATA LIMITED
DATA TERMINALS AND MICROCOMPUTER SYSTEMS

Transdata Limited, Battlebridge House 87-95 Tooley Street, London, SE1 2RA Telephone: 01 403 5115 Telex: 8952068

● **Circle No. 325**

Wida Software

Specialists in Educational Software For Schools and Colleges

APFELDEUTSCH	Computer Assisted Course in German: Beginners to O'Level: Textbook: Workbook; 6 Language Lab Cassettes; 9 Apple diskettes of teaching and testing routines. Apple only: Complete set: (20% discount for schools)	£120.00
GERMAN ROUTINES	Individual Testing Routines: article and adjective endings, pronouns, word order, etc. Send s.a.e. for details. Any four routines: Apple Disk / Pet Cassette	£15.00 / £10.00
TEACHER'S TOOLKIT	Starter Pack for building up library of tests. No knowledge of computing needed. Suite of 5 programmes: Tester, Testmaker, Editor, Multiple Choice Specimen, Directory of Tests. Apple Disk / Pet Cassette	£20.00 / £15.00
APPLE PILOT	The Ultimate Language for Teachers: Mix sound graphics and text for questions on screen Disks & Manuals	£76.00
ARISTOTLE'S APPLE	Tutor and Test Mode; fill-in, multiple choice, matching; includes alternative answers Apple only Disk & Manual	£20.00
PEDAGOG AIDS	Life Raft for Teacher Thrown into Depths of Computer Studies. 20 Apple programs to O'Level 10 Apple Disks	£60.00
FRENCH & GERMAN CHIP	Plug-in Replacement Chip for (New ROM) Pet Gives Umlauts, accents, etc. Full instructions. Kit (Pet only)	£35.00
THE LOWBROOK TAPES	Suite of 6 Numeracy programmes for the primary school (fractions, carrying over, etc) Pet cassette	£10.00
SHAPE MANAGER	Does for shapes what a word processor does for words. From Sinta Software. Kit (Apple)	£59.95
TYPE-RIGHT	Lower-Case word processing with Apple Writer. Full shift key operation. Plug-in fitting with disable switch. Manual, fitting instructions, software on disk. Apple only	£46.50

All prices incl. VAT:

WIDA SOFTWARE 2 Nicholas Gardens, London W5 5HY. Tel: 01-567 6941

● Circle No. 326

Mailing Floppy Disks?

Use Swan Disk Mailers — and get Safety in the Mail

Now used by over 1,000 computer companies, Swan Disk Mailers provide outstanding postal security at economical prices.

Combining great strength with simplicity of use, Swan Disk Mailers are manufactured from rigid white corrugated, holding up to four disks.

There are two sizes available: 8·75"X 8·75" & 6"X 6"

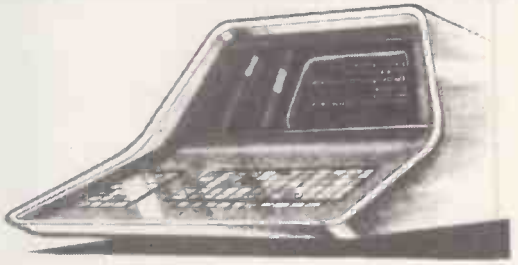
ring
01-607 9938
for Free samples and prices

● Circle No. 327

S T Commercial Systems Ltd

Brain Specialists

Simplify all your accounting
Sales, Purchases, Invoicing,
Payroll, Stock control
VAT Reports
Even Trial balances and
P & L Accounts



SuperBrain can work as a word processor
Provide All Tektronix type graphics
and even emulate a Tektronix terminal.

- Communications to most mainframes and MINIS
- Runs IBM "BISYNC" protocol emulating 3270s or 2780s.
- Programming languages include PASCAL FORTRAN BASIC COBOL!
- Disk capacities from 360K to 10M bytes ● Prices from **£1,695** plus VAT
- Full range of CP/M software and peripherals
- NEC spinwriters. EPSON printer MICROPRO software
- **DEALERS BEST DISCOUNTS**

26 New Broadway, Ealing, London W5

- We also sell CROMEMCO and North Star Hardware. Telephone: 01-840 1926

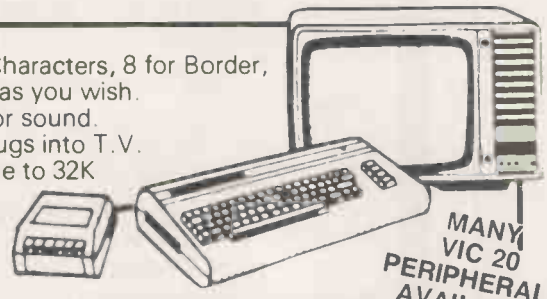
● Circle No. 328

CHROMASONIC electronics

48 JUNCTION ROAD, ARCHWAY LONDON N19 5RD 100 yds FROM ARCHWAY STATION & 9 BUS ROUTES
TELEPHONE: 01-263 9493/01-263 9495 TELEX: 22568.

YOUR SOUNDEST CONNECTION IN THE WORLD OF COMPUTERS

VIC 20

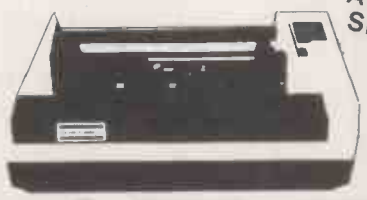


- 24 Colours, 8 for Characters, 8 for Border, 16 for screen mixed as you wish.
- 3 tone Generator for sound.
- Uses Pet Basic • Plugs into T.V.
- Memory expandable to 32K
- VIC complete with T.V. Modulator and Power Supply

ONLY £165.00

MANY VIC 20 PERIPHERALS AVAILABLE SEND FOR LIST

VIC Cassette Deck
ONLY £38.00



Available soon
VIC Dot Matrix Printer
80 Column, 30 CPS, Tractor Feed
ONLY £199.95

UK101

DOWN IN PRICE

UK101 Kit **inc 8K memory**	**£125**
Ready Built **inc 8K memory**	**£175**
Complete in case	**£199**
4K Expansion 8x2114	**£10**
Parallel Printer Interface	**£24.50**
Cases	**£19.95**
Chromasonics Sound Kit	**£24.50**
Colour Kit	**£69.95**

NEW NEW NEW

32K Dynamic Memory Board only	**£89.95**
P.I.O. and Eprom Programmer Kit only	**£24.50**

APPLE II PLUS

AUTOSTART "EUROPLUS"
48K Apple Computer **649.00**
Disc Drive with Controller **349.00**
Disc Drive without Controller **299.00**
Colour Card **69.00**
Silentype Printer **199.00**
Graphics Tablet **425.00**
TV Modulator **14.00**

A range of APPLE accessories and Software are available.

PET

4016 16K RAM	**445.00**
4032 32K RAM	**569.00**
8032 32K RAM	**755.00**
8096 96K RAM	**960.00**
4040 Disk Drive	**585.00**
8050 Disk Drive	**755.00**
4022 Printer 80 Col	**357.00**
8024 Printer 132 Col	**975.00**
8026 Printer/Typewriter	**835.00**
8027 Daisy Wheel	**735.00**

A range of PET accessories and software available

PRINTERS

INTERFACES AND CABLES FOR APPLE II, PET, TRS80, RS232, UK101, SHARP SUPER-BOARD ALL AVAILABLE.

EPSON MX80 £359
Dot-matrix printer with Pet graphics interface. Centronics parallel and serial. Pet and Apple compatible. True bidirectional, 80 cps.

EP80 MX82 £389
As MX80 plus high Resolution Graphics

EPSON MX80 FT/1 £399
Dual single sheet friction and tractor feed, 9 wire head, true descenders.

EPSON-MX80 FT/2 £440
An FT/1 with high resolution graphics.

SEIKOSHA GP80A £195
Dot matrix 5 x 7, 80 columns, 30 cps graphics, double width characters.

JUST PHONE FOR FURTHER DETAILS

VIDEO GENIE

Utilises Z80, 12K level II basic, integral Cassette Deck, UHF O/P, 16K RAM, all TRS80 features. Simply plugs into monitor or UHF TV. With V.U. Meter. Now with lower case and Sound Genie 1 £299.

PARALLEL PRINTER INTERFACE INC CABLE	£38.00
CHROMASONICS **PROGRAMMABLE** SOUND KIT	£24.50
SOUND KIT (FITTING EXTRA)	£8.20
LOWER CASE KIT (FITTING EXTRA)	£29.80
COLOUR KIT (FITTING EXTRA)	£36.00
EXPANSION BOX INC 16K RAM	£199
16K/32K RAM BOARD	£94/£129
NEW GENIE II NOW AVAILABLE	**£310**

MONITORS

9" Green Screen	**£99.00**	HITACHI PROFESSIONAL	
12" Green Screen	**£125.00**	9"	**£99.95**
12" BMC Green Screen	**£159.00**	12"	**£149.00**

TANTEL

PRESTEL BY TANTEL

COMMUNICATIONS AT YOUR FINGERTIPS FOR BUSINESS & HOME. UP TO DATE INFO

180,000 pages of information on Travel, News, Investment, Holidays, Hotels Etc., Etc.

£159

TANTEL IS POST OFFICE APPROVED. SEND FOR DETAILS.
DEMONSTRATION AVAILABLE AT OUR SHOWROOM.

ALL ITEMS CARRY 1 YEAR GUARANTEE

BARCLAYCARD VISA

Please add VAT 15% to all prices. Postage on computers, printers and cassette decks charged at cost, all other items P&P 30p. Place your order using your Access or Barclaycard (Min. tel. order £10). Export enquiries welcome. Official orders welcome.

● Circle No. 329

QADS

Q.A. DATA SYSTEMS
INFORMATION SERVICES

Marketing hardware or software — or just considering doing so.

Use our unique service to assist you. Supported by a nationally distributed minicomputer network.

Searching for hardware or software.

Looking for that special or for the nearest convenient source.

Use our unique electronic directory services for an on line or by return answer.

For further information contact:

P. Hayes, Q.A. Data Systems Ltd, Freepost, 11 St Georges Street, Chorley, Lancs PR7 1BR, (no stamp required).

Telephone: Chorley (02572) 66955.

● Circle No. 330

Knights T.V. & COMPUTERS

SHARP DEALS — MZ-80B £899

Deal A — Sharp MZ-80K with full 48K, BASIC, PASCAL + 10 programs. £345
Deal C — as deal A plus FORTRAN, FORTH + 16 programs. £379
Deal F — as deal ? plus MACHINE CODE, KNIGHT COMMANDER + 100 programs. £425
Deal ? — Sharp MZ-80B with 64K, RAM, 8K VRAM, 4K ROM, and BASIC. £899
Deal 1B — as deal 1 plus our MZ-80B easy Assembler + 70 programs. £979

NEW PRODUCTS FOR SHARP

MZ-80P4 160 column/150cps £645, MZ-80 single floppy disk, the PC1511 hand held computer and colour printer, MZ-80DU colour terminal.

NEW SOFTWARE FOR SHARP

KNIGHT COMMANDER for the MZ-80B giving RENUMBER, TRACE, SINGLE STEP, DUMP VARIABLES, etc. — as supplied to Sharp. Our latest B programs include Jumbo Flight Simulator, Dis-assembler and Circuit Of Doom. For the MZ-80K we introduce Machine Code Trace, KNIGHTS POWER MONITOR, Russian Gold Divers, Fighter Cockpit, etc. We are just back from Japan for the second time in six months and have hundreds of exclusive Sharp items. Write, phone or telex for our latest prices and newsletters. All prices exclude VAT but inclusive delivery. ACCESS and VISA welcomed.

KNIGHTS TV AND COMPUTERS
108 Rosemount Place, Aberdeen.
Telephone: (0224) 630526. Telex: 739169 KNIGHT

● Circle No. 331

MAXIMUM VALUE... MINIMAL COST

The Houston Instrument range of HI-PAD digitisers:

- Well designed and ruggedly constructed
- Active surface 11" x 11" with .005" resolution
- Easy to interface via RS232C port or Parallel port
- Relocatable origin
- Translucent surface
- Imperial/metric selectable
- Choice of cursor or stylus
- Highly reliable electromagnetic technology (not magnetic)
- Point or stream modes

DT-11 Standard Hi-Pad **£615**

DT-11A Hi-Pad for use with Apple (inc I/F and S/Ware) **£635**

DT-114 As DT-11 but with 4 button cursor **£730**

SINTROM GROUP

Sintrom Electronics
YOUR GRAPHICS PERIPHERAL SPECIALIST

Sintrom Electronics Ltd
Arkwright Road, Reading, Berks RG2 0LS
Tel: Reading (0734) 85464
Telex: 847395

OEM & DEALER ENQUIRIES WELCOME

PSA PERIPHERAL SUPPLIERS ASSOCIATION

● Circle No. 332

WAGES AND SALARIES

Is the payout costing you more than it should?

SUPERPAY and BASICPAY — two payroll systems from Computastore to cut the cost of payroll, whatever the size of your company.

Over the past two years Computastore Payroll systems have proved their effectiveness for over 700 companies — ranging in size from six employees to over a thousand.

Suitable for *all* types of PET and CBM Disk, Computastore's SUPERPAY and BASICPAY are the only Payroll Programs approved by Commodore.

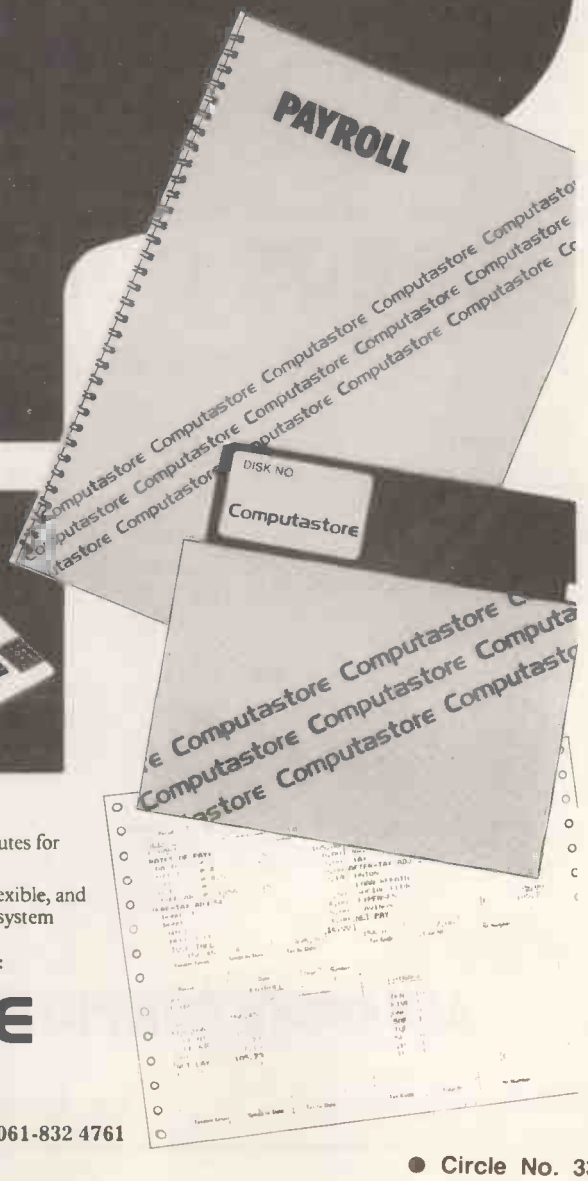
SUPERPAY £350

- **Easy to read departmental analysis with up to 20 rates of pay and adjustments, for up to 26 departments.**
- **Automatic printing of year end P60's, P11's and P35's.**
- **Automatic printing of credit transfers.**
- **Automatic increase of all tax codes for budget changes.**
- **Net Pay Rounding to any amount less than £10.**
- **PLUS all of BASICPAY's standard features.**

BASICPAY £125

- **Automatic calculation of Tax and NI for weekly, monthly, four weekly, or irregular payment periods.**
- **Automatic advancement of tax week for holiday periods.**
- **Automatic coin analysis for cash payments.**
- **Can produce individual payslips.**
- **Option to process all employee payslips automatically.**
- **Easy to install. Even newcomers to computers can use BASICPAY within a few hours.**

COMMODORE APPROVED



Each program takes no more than 35 seconds per employee for build up to gross, net pay calculation, and printing a payslip in duplicate.
That works out at only 2 hours each week for a typical payroll of 200, or just 15 minutes for a staff of 20.

SUPERPAY is designed for medium size companies which need a comprehensive, flexible, and easy to use payroll; BASICPAY is for small companies who want a flexible, low cost system which carries Commodore's seal of approval.

For the name of your local Computastore Agent, contact:

Computastore

Computastore
Computing for Business

Computastore Ltd., 16 John Dalton St., Manchester M2 6HG. Tel: 061-832 4761

● Circle No. 333

TRS-80 I,II&III

Superior Disk Software

ELECTRIC SPREADSHEET — eat your heart out VisiCalc users — this second generation product takes over where VisiCalc left off.
Mod I/III £39.50/£43.50

STRINGSPEED — ever wondered why programs with more than a few strings occasionally appear to stop, sometimes for minutes, and then re-start — well its because your interpreter is reorganising the string pool — STRINGSPEED dramatically reduces reorganisation times. With 1,000 active strings reorganisation is cut from 150 secs to just 4.5 secs, with 4,000 active strings from 2,300 secs to just 22 secs — over 100 x faster.
Mod II/III £54.50/£43.50

AUTOMAP creates formatted screens and automates the programmers task of communicating and displaying information with the user operator. By reducing this task to simple SEND and RECEIVE commands, AUTOMAP will dramatically increase your programming productivity.
Mod II/III £54.50/£43.50

AUTOFILE makes for easier, faster random access file handling. No more need for FIELD, MKI$, LSET, CVS etc, as all conversions are now handled directly by your interpreter. Requires no user memory.
Mod II/III £3.50/£35.00

TASMON is simply the best monitor available and has far too many features to list here — write or call for details.
Mod I/III £17.00

NEW: DOPLUS a superior DO processor, SMARTTERM a communications package, SPOOL-80 a true disk to printer despooler, RENTALS lease/rental stock control, WIZARDS CASTLE & DUNGEON ESCAPE — wizard adventures!

Prices exclude VAT but include postage and packing

For a detailed catalogue send 75p to:

SYSTEM SOFT

49 Dunvegan Drive, Rise Park, Nottingham NG5 5DX.
Tel: (0602) 275559

● Circle No. 334

IBM SELECTRIC GOLFBALL PRINTERS and INPUT, OUTPUT 735 TYPEWRITERS

PRINTERS FROM	£195.00
735 TYPEWRITERS FROM	£245.00
WIRING AND COMMISSION TO SUIT ACULAB INTERFACE	£48.00
ACULAB INTERFACES EX STOCK	£155.00

ALSO AVAILABLE
IBM 71, 72, 82 typewriters
Full workshop facilities for rebuilds and servicing.
Keyboard ASCID-ASCII, 10-12 pitch, language conversions undertaken.
11", 13", 15" platen lengths, split platens pin feed platens.
Operational keylever repeats fitted on request.
Full IBM range of 10-12* pitch heads including language, symbol and metric.
Language keybuttons blue or grey.

WE BUY SELL OR EXCHANGE ALL IBM SELECTRIC TYPEWRITER MODELS

FOR FURTHER DETAILS PHONE

STUART KIRBY OR LOUIS BAKER

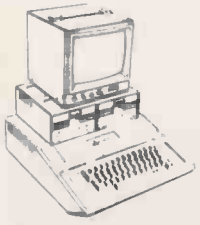
KEYTRONICS

UNIT 3, EASTINGTON TRADING ESTATE
EASTINGTON, NR STONEHOUSE, GLOUCESTER
TEL: 0453 824004

PRICES EXCL VAT @ 15% & CARRIAGE & PACKING
CALLERS BY APPT ONLY PLEASE

● Circle No. 335

LEEDS COMPUTER CENTRE



apple II EUROPLUS

48K	£675 + VAT
Disk with controller	£360 + VAT
Disk without controller	£275 + VAT

Monitors b/w or green.
Full range of Peripherals, Epson and Paper Tiger printers all discounted, Post & Packing £4.

VIC 20 **£150** + VAT P/P £3.00

FREE 6 programme tape with each C2N cassette recorder £40 inc VAT. Price includes fully tested unit with fitted plug. Complete range of Vic-Peripherals.

SHARP MZ 80K

48K MODEL
£345 + VAT
P/P £5.00

COMMODORE PET

NEW

4000SR. WITH LARGE 12" GREEN SCREEN

32K MODEL
P-P- £5.00 **£520** + VAT

Full range of printers Ricoh RP160. Daisy. Epson MX. Range. Walters BD80P.

COMPLETE RANGE OF COMMODORE EQUIPMENT EX-STOCK

Official orders welcome: goods dispatched 24hr delivery. Please phone for our lowest prices.

SALES **SERVICE** **SATISFACTION**

ADVANCED COMPUTER EQUIPMENT (LEEDS) LTD

95 MEADOW LANE, LEEDS 11

PHONE: 0532 446960 *ACCESS AND BARCLAYCARD WELCOME* **TELEX: 335909**

● Circle No. 336

WHY ARE 45 MULTINATIONALS C/WP CUSTOMERS?

C/WP is a long established service company based in Rochester Row, London SW1.

C/WP Computers is an Apple authorised level 1 service centre.

C/WP now offers Practical Computing readers the chance to buy at its special prices.

Contact C/WP if you are interested in:

Financial forecasting
Communications
CP/M on Apple

VISA

Apple/Visicalc offer

Apple 48K Europlus	£ 579
Disc drive with controller	£ 310
12" green monitor	£ 110
Silentype printer	£ 180
Visicalc 3.3	£ 100
	£1279

VAT and installation extra
12 months guarantee

C/WP

C/WP Computers
01-828 3127
108 Rochester Row
London SW1P 1JP

● Circle No. 337

FREE SOUND WITH VIDEO GENIE

CASE FOR OHIO SUPERBOARD OR UK101 ONLY £24
IN PLASTIC OR IN STEEL! £37
NUMBER PAD FOR ABOVE ONLY £12

WE CAN OFFER THE INCREDIBLE VIDEO GENIE FOR ONLY £279 INCLUDING SOUND! 32K EXPANSION INTERFACE FOR ONLY £279 AND 40 TRACK DISKS FOR ONLY £195 SINGLE AND £380 DUAL!

OHIO SUPERBOARD COMPLETE WITH SOUND, POWER SUPPLY, MODULATOR FULLY BUILT & TESTED FOR BRITISH T.V. STANDARDS ONLY **£159**

CENTRONICS 737 LETTER QUALITY PRINTER ONLY £345

PET – CENTRONICS FULLY DECODED INTERFACE NOW ONLY £49

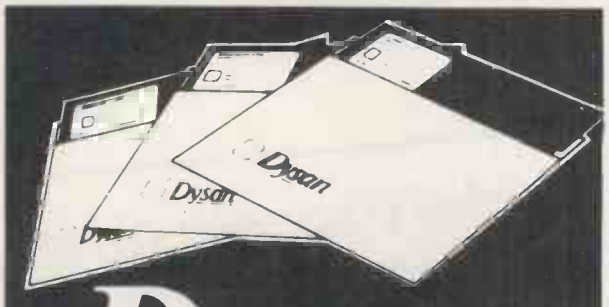
APPLE – CENTRONICS INTERFACE ONLY **£79!**

ALL PRICES INCLUDE POSTAGE & PACKING BUT EXCLUDE V.A.T.

KRAM ELECTRONICS, VICTORIA HOUSE, 17 HIGHCROSS STREET, LEICESTER

FREE POST (NO STAMP REQUIRED)

● Circle No. 339



Dysan

The best diskette for your system

As well as the standard range of diskettes we supply pre-formatted for: CPT 8000, Micom/P 5002, All IBM, AES/Lanier, Atari, Nexos 2200, Wang, Zenith, P 2000.

HAL

dysan

HAL Computers Limited
Invincible Road, Farnborough Hants. GU14 7QU.
Telephone 0252 517171

● Circle No. 338

YOUR QUICK LEARN WAY TO BASIC, COBOL & IBM 360

IN YOUR OWN HOME, IN YOUR OWN TIME, AT YOUR OWN PACE.

Learn computer programming quickly and easily through the renowned ICS "Open College" system.

Use the famous ICS study texts, backed up by your own expert tutor, and learn computer programming, the proven way, with ICS home study.

Introductory Course, BASIC, COBOL & IBM 360 Programming all covered.
... PLUS examination course for ASSOCIATE MEMBERSHIP OF THE BRITISH COMPUTER SOCIETY.

ALL DETAILS FREE—SIMPLY RETURN THE COUPON BELOW

Please send me your prospectus on Computer Programming.

ICS Approved by CACC Member of ABCC

To: Dept 346Q
ICS Intertext House
London SW8 4UJ or
Tel: 01-622 9911
(all hours)

Name.....
Address .....
.....
.....

● Circle No. 340

COMPUTER COMPONENTS

TTLs 74 SERIES

7400	11p
7401	11p
7402	12p
7403	12p
7404	12p
7405	18p
7406	25p
7407	25p
7408	14p
7409	15p
7410	12p
7411	20p
7412	20p
7413	22p
7414	32p
7416	25p
7417	25p
7420	16p
7421	20p
7422	22p
7423	22p
7425	27p
7426	30p
7427	25p
7428	28p
7430	15p
7432	25p
7433	27p
7437	27p
7438	27p
7440	17p
7441	70p
7442A	36p
7445	60p
7446A	93p
7447A	45p
7450	17p
7451	17p
7453	17p
7454	17p
7460	17p
7470	36p
7472	30p
7473	30p
7474	20p
7475	38p
7476	30p
7480	50p
7483A	45p
7485	60p
7486	22p
7489	210p
7490A	25p
7491	45p
7492A	30p
7493A	30p
7494	40p
7495A	50p
7496	45p
7497	120p
74100	85p
74107	22p
74109	30p
74116	60p
74118	75p
74119	90p
74120	70p
74121	27p
74122	45p
74123	40p
74125	40p
74128	40p
74132	30p
74136	32p
74141	65p
74142	200p
74145	50p
74147	100p
74148	75p
74150	60p
74151A	45p
74153	45p
74154	60p
74155	50p
74156	50p
74159	100p
74160	60p
74161	60p
74162	60p
74163	60p
74164	50p
74165	55p
74166	70p
74170	140p
74173	65p
74174	60p
74175	60p
74176	50p
74177	70p
74178	100p
74180	50p
74182A	130p
74182A	90p
74184A	90p
74185	120p
74186	500p
74188	325p
74190	50p
74191	50p
74192	50p
74193	50p
74194	70p
74195	60p
74196	60p
74197	60p
74198	100p
74199	100p
74221	60p
74259	150p
74278	150p
74279	80p
74283	75p
74284	200p
74285	200p
74290	200p
74293	100p
74298	100p
74365	40p
74366	40p
74367	40p
74368	55p
74390	100p
74393	100p
74490	120p

74LS SERIES

74LS00	11p
74LS01	12p
74LS02	12p
74LS03	12p
74LS04	12p
74LS05	15p
74LS08	14p
74LS09	15p
74LS10	15p
74LS11	15p
74LS12	15p
74LS13	25p
74LS14	40p
74LS15	30p
74LS20	15p
74LS21	15p
74LS22	15p
74LS26	15p
74LS27	18p
74LS28	18p
74LS30	14p
74LS32	14p
74LS33	16p
74LS37	16p
74LS38	16p
74LS42	40p
74LS47	40p
74LS51	15p
74LS55	30p
74LS73	75p
74LS74	16p
74LS75	24p
74LS76	20p
74LS83	45p
74LS85	55p
74LS86	16p
74LS90	35p
74LS92	40p
74LS93	35p
74LS95	45p
74LS96	100p
74LS107	45p
74LS109	30p
74LS112	34p
74LS113	30p
74LS114	30p
74LS122	42p
74LS123	50p
74LS124	120p
74LS125	30p
74LS126	30p
74LS132	45p
74LS133	30p
74LS136	30p
74LS138	34p
74LS139	36p
74LS145	75p
74LS147	160p
74LS148	90p
74LS151	30p
74LS153	40p
74LS154	90p
74LS155	40p
74LS156	40p
74LS157	35p
74LS158	36p
74LS160	40p
74LS161	40p
74LS162	40p
74LS163	40p
74LS164	45p
74LS165	100p
74LS166	90p
74LS170	90p
74LS173	70p
74LS174	60p
74LS175	50p
74LS181	140p
74LS190	50p
74LS191	50p
74LS192	50p
74LS193	60p
74LS194	40p
74LS195	50p
74LS196	60p
74LS197	65p
74LS221	60p
74LS240	80p
74LS241	80p
74LS242	80p
74LS243	80p
74LS244	65p
74LS245	90p
74LS251	40p
74LS253	40p
74LS257	45p
74LS258	40p
74LS259	90p
74LS260	24p
74LS266	25p
74LS273	70p
74LS279	45p
74LS280	250p
74LS283	45p
74LS298	160p
74LS299	400p
74LS323	250p
74LS324	180p
74LS348	150p
74LS365	32p
74LS367	32p
74LS368	50p
74LS373	80p
74LS374	80p
74LS375	50p
74LS377	70p
74LS378	60p
74LS390	55p
74LS393	60p
74LS399	200p
74LS445	110p
74LS540	135p
74LS541	135p
74LS640	200p
74LS641	200p
74LS642	200p
74LS643	200p
74LS644	250p
74LS645	250p
74LS668	200p
74LS669	200p
74LS670	170p

74S SERIES

74S00	60p
74S02	60p
74S04	60p
74S05	75p
74S08	75p
74S10	60p
74S11	60p
74S20	60p
74S30	60p
74S32	90p
74S37	90p
74S37	60p
74S74	90p
74S85	300p
74S86	180p
74S112	90p
74S113	90p
74S114	90p
74S124	300p
74S132	160p
74S133	75p
74S138	225p
74S139	225p
74S157	250p
74S163	300p
74S174	250p
74S175	320p
74S188	350p
74S189	350p
74S194	350p
74S200	450p
74S201	400p
74S225	550p
74S241	400p
74S260	70p
74S261	300p
74S262	£10
74S287	350p
74S288	350p
74S373	400p
74S374	400p
74S471	650p
74S474	400p
74S571	900p
74S573	900p

4000 CMOS

4000	15p
4001	14p
4002	15p
4006	65p
4007	18p
4008	60p
4009	30p
4010	30p
4011	14p
4012	20p
4013	35p
4014	60p
4015	60p
4016	30p
4017	45p
4018	60p
4019	32p
4020	60p
4021	65p
4022	60p
4023	18p
4024	36p
4025	20p
4026	130p
4027	30p
4028	60p
4029	75p
4030	40p
4031	170p
4032	125p
4033	180p
4034	160p
4035	80p
4036	295p
4038	120p
4040	60p
4041	70p
4042	55p
4043	60p
4044	70p
4045	120p
4046	80p
4047	75p
4048	55p
4049	30p
4050	30p
4051	60p
4052	80p
4053	60p
4054	130p
4055	125p
4056	120p
4059	500p
4060	90p
4063	100p
4066	35p
4067	400p
4068	18p
4069	16p
4070	16p
4071	16p
4072	16p
4073	16p
4075	16p
4076	60p
4077	26p
4078	20p
4081	16p
4082	16p
4086	72p
4089	150p
4093	40p
4094	150p
4095	95p
4096	95p
4097	340p
4098	90p
4099	90p
40102	150p
40103	180p
40105	120p
40106	50p
40109	100p
4501	28p
4502	70p
4503	50p
4504	75p
4506	35p
4507	40p
4508	200p
4510	65p
4511	50p
4512	65p
4514	150p
4515	150p
4516	75p
4518	50p
4520	70p
4521	150p
4526	75p
4527	90p
4528	75p
4532	90p
4534	500p
4536	300p
4538	120p
4539	120p
4543	100p
4553	290p
4555	45p
4556	45p
4560	180p
4566	180p
4568	300p
4569	180p
4583	90p
4584	50p
4585	100p
40014	90p
40085	120p
40097	90p
40163	115p
40174	95p
40175	100p
40193	115p
14500	700p
14599	290p

LINEAR I.Cs

AN103	200p
AY1 0212	600p
AY1 1313	668p
AY1 1320	320p
AY1 5050	140p
AY3 8910	700p
AY3 8912	650p
AY5 1224A	240p
AY5 1315	600p
AY5 4007D	520p
CA3028A	120p
CA3019	80p
CA3046	70p
CA3048	225p
CA3080E	72p
CA3086	48p
CA3089E	225p
CA3090AQ	375p
CA3130E	90p
CA3140E	50p
CA3160E	100p
CA3161E	140p
CA3162E	450p
CA3189E	300p
CA3240E	120p
CA3280G	200p
DAC1408 8	200p
HA1388	270p
ICL7106	850p
ICL8038	300p
ICM7555	80p
IC7120	600p
LC7130	475p
LF347	180p
LF351	48p
LF353	100p
LF356P	95p
LF357	120p
LM10C	425p
LM301A	27p
LM311	75p
LM318	200p
LM319	225p
LM324	45p
LM3352	140p
LM339	65p
LM348	75p
LM358P	75p
LM377	175p
LM380	75p
LM381AN	180p
LM382	120p
LM386	95p
LM387	120p
LM389	95p
LM393	100p
LM709	36p
LM710	50p
LM725	350p
LM733	100p
LM741	18p
LM747	70p
LM748	35p
LM2917	200p
LM3302	140p
LM3900	65p
LM3909	95p
LM3911	130p
LM3914	210p
LM3915	225p
LM3916	225p
LM13600	125p
M51513L	300p
M51516L	400p
M83712	200p
MC1310P	150p
MC1458	40p
MC1495L	350p
MC1496	70p
MC3340P	120p
MC3403	120p
MK50398	750p
ML920	800p
MM57160	820p
MN6221A	£6
NE531	250p
NE555	20p
NE558	50p
NE564	420p
NE565	130p
NE566	165p
NE567	140p
NE570	425p
NE571	425p
NE5534A	250p
PLL02A	500p
RC4136	70p
RC4151	200p
S5668	260p
SAD1024A	1250p
SFF96364	800p
SL490	350p
SN76477	175p
SP8515	750p
TA7205	250p
TAA621	275p
TBA641811	300p
TB7120	200p
TA7204	250p
TA7222	200p
TA7310	200p
TAA621	275p
TBA651	200p
TBA800	90p
TBA810	100p
TBA820	80p
TBA950	300p
TCA220	350p
TCA940	175p
TOA1004A	300p
TOA1008	320p
TDA1010	225p
TDA1022	600p
TDA1024	120p
TDA1034B	250p
TDA1170	300p
TDA2002V	325p
TDA2020	320p
TLO71/81	45p
TLO72/82	75p
TL074	130p
TL084	110p
TL094	200p
TL170	160p
TL430C	70p
UAA170	170p
UA2240	300p
UDN6118	320p
UDN6184	320p
ULN2003	100p
UPC575	400p
UPC592H	200p
UPC1156H	300p
XR2206	300p
XR2207	400p
XR2211	600p
XR2215	675p
ZN414	90p
ZN419C	225p
ZN423E	150p
ZN424E	135p
ZN425E	360p
ZN427E	625p
ZN1034E	200p

VOLTAGE REGULATORS
FIXED PLASTIC

	+ ve		−ve	
1A				
5V	7805	50p	7905	55p
12V	7812	50p	7912	55p
15V	7815	55p	7915	60p
18V	7818	55p	7918	60p
24V	7824	55p	7924	60p
5V 100mA	78L05	30p	79L05	65p
12V 100mA	78L12	30p	79L12	70p
15V 100mA	78L15	30p	79L15	70p

OTHER REGULATORS

LM309K 1A 5V	135p	78HGKC	600p
LM317K	325p	78HO5KC	550p
LM312T 1A Adj	200p	78MGT2C	140p
LM337T	225p	78GUIC	200p
LM323K 3A 5V	500p	79GUIC	225p
LM723 150mA Adj	37p	79HGKC	700p
TL494	400p	TL497	300p
78S40	300p	LM305AH	250p

*** SPECIAL OFFER ***

	1-24	25-99	100+
2114 L-450ns	95p	90p	85p
2114L-200ns	100p	95p	90p
2716	225p	210p	200p
4116-200ns	75p	70p	65p

CPUs

1602CE	750p
2650A	£12
6502	450p
6502A	650p
6800	370p
6802	500p
6809	£10
6809E	£15
8035	760p
8039	850p
8080A	350p
8085A	550p
INS8060	£11
TMS9980	£20
Z80	370p
Z80A	450p
Z80B	£16
8088	£19

SUPPORT DEVICES

3242	800p
3245	450p
5522	500p
6532	775p
6551	700p
6821	180p
6845	£10
6847	£10
6850	180p
6852	370p
6875	600p
8154	950p
8155	800p
8205	320p
8212	180p
8216	180p
8224	250p
8226	250p
8228	250p
8243	450p
8250	850p
8251	350p
8253	800p
8255	350p
8257	800p
8259	800p
8279	950p
TMS9918	£60
Z80PIO	350p
Z80APIO	400p
Z80CTC	350p
Z80ACTC	400p
Z80ADART	800p
Z80ADMA	£12
Z80S10 1	£20

MODULATORS

6MHz UHF	375p
8Mz UHF	450p

MEMORIES

2101A	400p
2102 2L	120p
2107B	500p
2111A	300p
2112A	300p
2114 2L	160p
2114 4L	130p
2147	450p
4027 3	300p
4044 45	700p
4116 15	200p
4116 20	200p
4118 3	500p
4118 4	450p
4164 2	800p
5101	300p
6116P 3	900p
6514 45	400p
6810	200p
7489	210p
74S189	325p
74S201	350p
74S289	325p

ROM & PROM

74S188	325p
74S287	308p
74S288	226p
74S387	325p
74S471	650p
74S473	850p
74S474	650p
74S570	650p
74S571	650p
74S573	950p

EPROMs

1702A	500p
2708	300p
2716	300p
2564	£38
2516	300p
2532	600p
2732	600p
2716-300	£5
2732-300	£7.50

BAUD RATE GENERATORS

COM8116	£8
MC14411	£7

UARTs

AY 3 1015P	300p
AY 5 1013P	350p
IM6402	450p
TR1602	300p
COM8017	300p

CHARACTER GENERATORS

RO 3 25130UC	750p
RO 3 25131UC	700p

74S262	£10

INTERFACE ICs

AD558CI	775p
AD561J	£14
AM25S10	350p
AM26LS31	160p
AM26LS32	190p
DAC80	£20
DM8131	375p
DP8304	450p
DS8832	250p
DS8833	225p
LF13002	450p
MC1488	65p
MC1489	65p
MC3418	950p
MC3446	300p
MC3480	850p
MC3485	500p
MC4024	325p
MC4044	325p
MM58174	£12
ULN2003A	100p
ULN2004A	100p
75017	160p
75110	160p
75112	160p
75114	160p
75115	160p
75150P	140p
75154	140p
75182	220p
75324	325p
75361	150p
75363	150p
75365	160p
75451.2	72p
76453.4	72p
75491.2	70p
8T26/28	120p
8T95/96	90p
81LS95	120p
81LS96	140p
81LS97	120p
81LS98	140p
9602	220p
9687AP	160p
ZN425E 8	350p
ZN426E 8	350p
ZN427E 8	650p
ZN428E 8	600p

DISC CONTROL

FD1771	£20
FD1791	£30
WD1691	£15
WD2143	559p
FD1793	£32
FD1795	£35
FD1797	£37

CRYSTALS

32 768KHz	100p
100KHz	300p
200KHz	370p
1 0MHz	320p
1 008MHz	350p
1 8432MHz	250p
2 00MHz	250p
2 4570MHz	250p
3 276MHz	150p
3 5795MHz	100p
3 686MHz	300p
4 00MHz	150p
4 194MHz	250p
4 43MHz	125p
500 MHz	175p
6 0MHz	150p
6 144MHz	150p
7 0MHz	150p
7 168MHz	200p
8 00MHz	175p
8 86MHz	175p
10 00MHz	175p
10 7MHz	250p
12MHz	350p
14 3168MHz	150p
16 00MHz	250p
18 00MHz	200p
18 432	250p
19 968MHz	390p
20 000MHz	175p
26 690MHz	300p
27 145MHz	250p
38 667MHz	350p
48 0MHz	300p
55 5MHz	400p
116 000MHz	350p

KEYBOARD ENCODER

AY 5 2376	700p
74C922	600p

CRT CONTROLLER

COM5037	£18
SFF93634	£8
TM59927	£18
6845	£10
6847	£10
9365	£60

DIL SWITCHES

4 Way	90p
6 Way	105p
9 Way	120p
10 Way	150p

ZIF SOCKETS

24 Pin	600p
40 Pin	£11

LOW PROFILE DIL SOCKETS BY TEXAS

8 pin	9p	18 pin	16p	24 pin	24p
14 pin	10p	20 pin	18p	28 pin	26p
16 pin	11p	22 pin	22p	40 pin	30p

WIRE WRAP SOCKETS BY TEXAS

8 pin	25p	18 pin	50p	24 pin	70p
14 pin	35p	20 pin	60p	28 pin	80p
16 pin	40p	22 pin	65p	40 pin	100p

★ ZX80/81 USER PORT ★

(Described in PCW Oct/Nov 81)

ADD SOUND, PLUS RELAY CONTROL & LIGHT DETECTION TO YOUR ZX80/81.

Port module plugs directly in to ZX80/81 to provide 8 input and 8 output lines. These allow input of data from switches, photocells, sensors, joysticks etc and control of 8 relays. Also, 7 segment displays and LED may be used — "VARIABLE TONE AUDIO OUTPUT CAN PRODUCE YOUR OWN SOUND EFFECTS." Port access is by simple PEEK & POKE commands.
Ready built and tested £14.95 + P&P 70p + VAT. Kit £11.50.
Reprint of PCW Oct/Nov, articles £1.00 + large SAE.
For ZX81 USERS, extender card to accept the RAM PACK provided so no need for expensive mother board.

★ ACORN ATOM ★

A personal computer with full size QWERTY keyboard and a built-in UHF modulator for direct connection to domestic TV. Available as Basic Kit 4K RAM + 8K ROM £120, Basic built £140. Built and fully expanded £188. P&P £3.00. PSU £10.20 + £1.00 P&P. Atom software also available.

★ UK 101 — INTERFACING SYSTEM ★

The two board interface system plugs directly into the computer expansion skt to provide wide facilities accessible from BASIC or MACHINE CODE.

1) DECODING MODULE: Provides dual 5v supply, 16 bit programmable 1/0 port, plus extensive decoding for various interfaces incl full decoding for programmable sound generator. Kit £27.50.
2) ANALOGUE BOARD: Provides D/A converter, 8 channel multiplexed A/D converter. AY3-8910 + 6522 VIA provide complex timing and counting functions and 16 bit port. Kit £27.50.

MEMORY EXPANSION PCB

LOW price versatile system for ATOM, UK 101 and Superboard compact memory expansion PCB. Various combinations provide 8K RAM + 4, 8 or 16K EPROM or 16K Static RAM (for ATOM 5K RAM + up to 16K EPROM or 13K RAM). Fully buffered and decoded layout. Interfacing instuctions supplied. PCB £11.50.

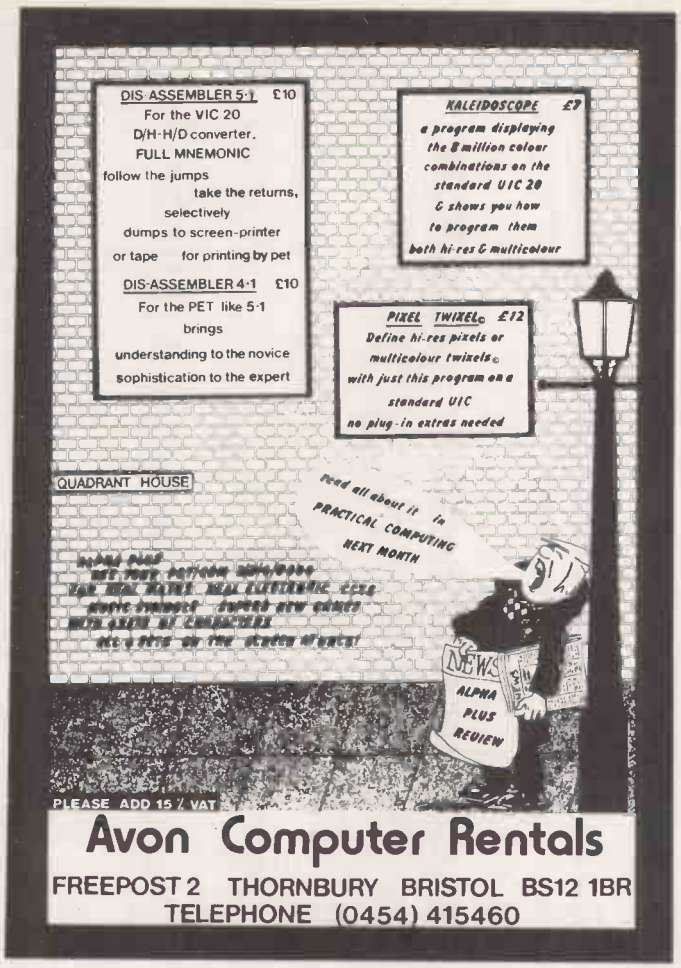
TECHNOMATIC LTD.

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW10 1ED
SHOPS AT: 17 BURNLEY ROAD, LONDON NW10
(Tel: 01-452 1500, 01-450 6597. Telex: 922800)
305, EDGWARE ROAD, LONDON W2 Tel: 01-723 0233

SEND SAE FOR DETAILED PRICE LIST

PLEASE ADD 40p P&P & 15% VAT (Export no VAT)
Government, Colleges, etc. ORDERS WELCOME
BARCLAY & ACCESS CARDS ACCEPTED
STOCK ITEMS ARE NORMALLY BY RETURN OF POST

● Circle No. 341



● Circle No. 342

MICROAGE ELECTRONICS

* Personal Computers * TV Games
* VCR's * Printers * Monitors * Software

ATOM's and DAI's ALWAYS IN STOCK

Complete range of Atari games.
Open Mon – Sat. 9am till late.
Credit cards welcome.

LOW PRICES!
LOW PRICES!
LOW PRICES!

The P31 12" Monitor £104.50 inc. VAT.

The Acorn Cassette Recorder £22.50.
Tested . . . "works very well with the ZX81, great with TRS80, fantastic with the Atom . . ."

Send for price list and mail order details.
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP
TEL: 01-959 7119 TELEX 881 3241

● Circle No. 343

Software for CP/M™

MICRO PRO		LIST
Wordstar™ 3·X		£250
Mail Merge		£ 60
Data Star		£170
Supersort I		£120
Spellstar (USA dictionary)		£120
Calcstar		£150
NEW Compiler Systems	CB 80 (True Compiler)	£280

MICRO SOFT	LIST
Basic-80 Interpreter	£150
Basic Compiler	£190
Fortran-80	£210
Cobol-80	£310

MISC		LIST
Compiler Systems	CBasic-2	£ 65
Sorcim	Pascal/M	£120
Sorcim	Supercalc	£170
Ashton Tate	d Base II	£380
NEW Ecosoft MicroStat		£150
Organic	Milestone (critical path)	£160

CP/M is TM of Digital Research. WORDSTAR is TM of Micro Pro

Other Products constantly being added to our range.
Send *large* s.a.e. for latest list

TRADE ENQUIRIES WELCOME

Ordering Instructions:
Cash with order. Specify disk format.
Add £3.00 per item P&P. Add 15% VAT

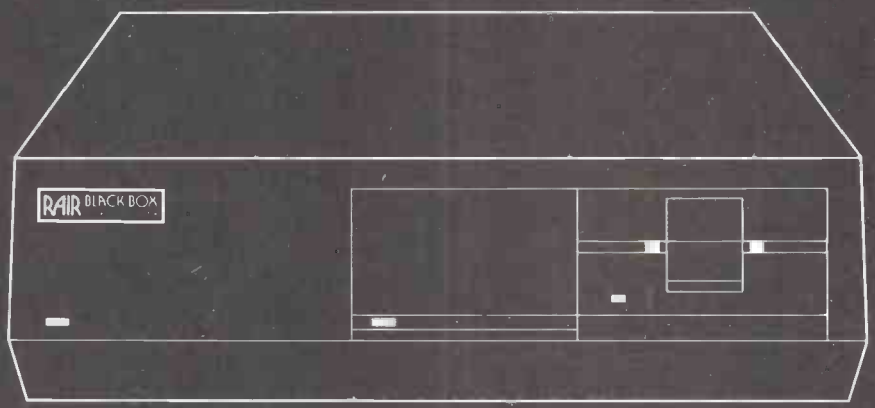
BARCLAYCARD VISA

the soft option

PO BOX 11 CRANBROOK KENT
TN17 2DF Tel: (058 080) 310

● Circle No. 344

BLACK BOX



The original personal computer

UK Black Box Suppliers

T & V Johnson (Microcomputers) Ltd Steve Johnston, Johnson House, 75-79 Park Street, **Camberley,** Surrey Tel: 0276 20446 **and** Ian Kitching, 148 Cowley Road, **Oxford** Tel: 0865 721461 **Rockmain Ltd** Vincent Spain, Anzeec House, 6 Stour Street, **Canterbury** CT1 2NR Tel: 0227 61218 **and** Dan Reid, 21 Bloomsbury Way, **London** WC1A 2TH Tel: 01-404 5958 **Lion Microcomputers Ltd** Ray Darker, 227 Tottenham Court Road, **London** W1P 0HX Tel: 01-637 1601 **NSC Computer Shop Ltd** Adam Wiseberg, 29 Hanging Ditch, **Manchester** ME4 3ES Tel: 061 832 2269
Digitus Limited Suren Patel, 9 Macklin Street, **London** WC2 Tel: 01-405 6761
Alphasoft Tom Maxfield, 906/908 Shields Road, Walkergate, Newcastle NE6 5QP Tel: 0207 30863
Gate Microsystems Ltd Ian Glenn, Nethergate Centre, 35 Yeaman Shore, Dundee DD1 4BU Tel: Tel: 0382 28194 **and** Bob Nicholson, Abbey House, 10 Bothwell Street, **Glasgow** G2 6NU Tel: 041-221 9372
Claremont Memories Benny Placido, 112 Cornwall St. South, **Glasgow** G41 1AA Tel: 041-427 5364
Bestmoor Ltd Norman Burley, Bestmoor House, 147 Derby Road, **Nottingham** NG7 1NE Tel: 0602 415315
HLW Computer Services Ltd Carl Blencoe, 1st Floor, Gloucester House, Smallbrook, Queensway, **Birmingham** B5 4HP Tel: 021-643 5831
Metcalf Microsystems Ltd Mark Metcalf, 111 High Holborn, **London** WC1 Tel: 01-989 0430
British Micro Joe Speight, Mawdsleys, Uley Road, **Dursley,** Glouc s. Tel: 0453 3154
Gibson Computer Services Julian Jenkins, 21-23 Holloway Chambers, 27 Priory Street, Dudley, West Midlands DY1 1EU Tel: 0384 236934
Software Ireland Ltd Des Milligan, 26 Linenhall Street, **Belfast** BT2 8PJ, Northern Ireland Tel: 0232 47433
Vixon Computer Systems Ltd John Broughton, 49 Grimsby Road, **Cleethorpes,** South Humberside DN35 7AQ Tel: 0472 58561

Rair Limited, 6-9 Upper St. Martin's Lane, London WC2H 9EQ Tel: 01-836 6921

RAIR

01-836 6921

MICROTEK

where SOFTWARE meets HARDWARE

SHARP 3201 COMPUTER

Full Systems available, Choice of Printers - Accounts, Payroll, Stock Control, Invoicing - Custom Programming to order. From £2,995 + VAT

For further details write to:

MICROTEK 15 Lower Brook St. Ipswich, Suffolk tel. (0473) 50152

● Circle No. 345

ARTIC

moving ahead with ZX software

Computing

NEW

16K RAM PACKS ONLY £35.00

ZX CHESS & ADVENTURES

PROGRAMS FOR THE ZX81/80 INCLUDING —

ZX CHESS I reduced to £8.00

Very popular machine code program, with six levels of play and an analysis option. Unbeaten except by:

ZX CHESS II now only: £15.00

A new improved version, with a faster response time, seven levels of play, and in addition a recommended move option.

ADVENTURES

Exciting machine code games with instant response, choose from the range below. You find yourself stranded on an alien planet.

ADVENTURE 'A' £5.00

Can you reach your ship and escape?

ADVENTURE 'B' £7.00

In a jungle clearing you come across an Inca temple. You must break in, collect treasure and escape alive. Beware. Includes a cassette save routine.

ADVENTURE 'C' £7.00

You are unfortunate enough to be drawn to an alien cruiser. Can you reach the control room and free yourself or will they get you first? Includes a cassette save routine.

GALAXY WARRIOR £3.00

Fast and exciting interactive animated graphics game. Hunt clingons and go through black holes. . . .

1K GAMES PACK £3.00

and many more. For a catalogue giving full details, please send a S.A.E. to,

Artic Computing,

396 James Reckitt Avenue, Hull, HU8 0JA.

● Circle No. 346

AMERICAN MAIL ORDER & SOFTWARE

Please tick the programs you require and use this page as your order form. Including your name, address & machine type. All prices include VAT, postage & packing.

Send 50p for full catalogues of software available.

DEALER ENQUIRIES INVITED

DYNACOMP	**ATARI**	
☐ Stud Poker	16K(C)	10.99
☐ Moonprobe	16K(C)	9.99
☐ Alpha Fighter	24K(C)	11.99
☐ Intruder Alert	16K(C)	15.99
☐ Giant Slalom	16K(C)	11.99
☐ Monarch	16K(C)	10.99
☐ Crystals	24K(C)	9.99
☐ Nominoes	24K(C)	15.99
☐ Chomp Othello	16K(C)	10.99
C. E. SOFTWARE		
☐ Helicopter Battle	16K(C)	9.95
☐ Tractor Beam	8K(C)	9.95
☐ Kend	8K(C)	9.95
☐ Horseracing	16K(C)	9.95
☐ Supermaster	8K(C)	9.95
☐ Mad Marble	8K(C)	9.95
☐ Lightning Bolts & Reaction	16K(C)	9.95
☐ Musigame	16K(C)	9.95
☐ Tag	16K(C)	9.95
☐ War at Sea	16K(C)	14.95
U.S.A. SOFTWARE		
☐ 3-O Supergraphics	40K(C)	39.99
CRYSTALWARE		
☐ House of Usher	0	19.99
☐ Galactic Quest	0	19.99
☐ Sumer	0	11.99
☐ Laser Wars	0	19.99
☐ World War 3	0	19.99
☐ Beneath the Pyramids	0	19.99
☐ Sands of Mars	0	26.99
☐ Little Crystal	0	26.99
☐ Fantasy Land 2041	0	34.99
☐ Waterloo	0	32.99
☐ Quest for Power	0	26.99

ADVENTURE INTERNATIONAL	**ATARI**	**TRS-80**	
☐ Adventureland	24K(C)	16K(C)	16.50
☐ Pirate's Adventure	,,	,,	,,
☐ Mission Impossible	,,	,,	,,
☐ Voodoo Castle	,,	,,	,,
☐ The Count	,,	,,	,,
☐ Strange Odyssey	,,	,,	,,
☐ Mystery Fun House	,,	,,	,,
☐ Pyramid of Doom	,,	,,	,,
☐ Ghost Town	,,	,,	,,
☐ Savage Island Part 1	,,	,,	,,
☐ Savage Island Part 2	,,	,,	,,
☐ Golden Voyage	,,	,,	,,
☐ Star Trek 3.5	32K(C)	,,	16.50/12.50
☐ Lunar Lander	16K(C)	,,	12.50
☐ Galactic Trader	32K(C)	,,	16.50/12.50
☐ Galactic Empire	32K(C)	,,	16.50/12.50
☐ Galatic Revolution	32K(C)	,,	16.50/12.50

AVALON HILL			
☐ B-1 Nuclear Bomber	16K(C)	16K(C)	12.50
☐ Midway Campaign	32K(C)	16K(C)	12.50
☐ North Atlantic Convoy Raider	16K(C)	16K(C)	12.50
☐ Planet Miners	24K(C)	16K(C)	12.50
☐ Lands of Karma	40K(C)	48K(C)	17.50
☐ Computer Acquire	N/A	16K(C)	17.50
☐ Conflict 2500	32K(C)	16K(C)	12.50
☐ Empire of the Evermind	40K(C)	48K(C)	24.95
☐ Tanktics	24K(C)	16K(C)	19.95

ADVENTURE INTERNATIONAL	**TRS-80**	
☐ Curse of Crowley Manor	16K(C)	16.50
☐ Escape from Traam	16K(C)	16.50
☐ Balrog Sampler	32K(D)	24.95
☐ Stone of Sisyphus	32K(C)	24.95
☐ Morton's Fork	32K(D)	24.95
☐ Little Red Riding Hood	16K(C)	12.50
☐ Match Maker	16K(C)	12.50
☐ Old McDonald's Farm	16K(C)	12.50
☐ Six Micro Stories	32K(D)	12.50
☐ Local Call for Death	32K(D)	16.50
☐ Two Heads of the Coin	32K(D)	16.50
☐ His Majesty's Ship "Impetuous"	32K(D)	16.50
☐ Dragons of Hong Kong	32K(D)	16.50
☐ Missile Attack	16K(C)	12.50
☐ Frog	,,	12.50
☐ Planetoids	,,	16.50
☐ Showdown	,,	12.50
☐ Silverflash	,,	12.50
☐ Tunnels of Fahad	,,	12.50
☐ Musical YAT-C	,,	12.50
☐ Maxi Manager	48K(D)	84.50
☐ Starfighter	16K(C)	20.95
☐ Zossed in Space	,,	12.50
☐ Star Scout	,,	12.50
☐ Treasure Quest	,,	12.50
☐ Slag	,,	12.50
☐ FOM	,,	17.50
☐ Conquest of Chesterwoode	,,	16.50
☐ Mean Chicken Machine	,,	12.50
☐ Back-40 III	,,	12.50
☐ Z-Chess III	,,	20.95
☐ Project Omega	,,	12.50
☐ Sinutek	,,	12.50

The Avalon Hill games include the programs for TRS-80, Atari, Apple & Pet on the same tape.

TRS-80 trademark of Tandy Corp Apple trademark of Apple Inc. PET trademark of CBM Inc.

Atari trademark of Atari

CALISTO COMPUTERS LIMITED

SPECIALISTS IN MICROCOMPUTER HARDWARE/SOFTWARE

119 John Bright Street Birmingham B1 1BE Phone: 021-632 6458

BARCLAYCARD VISA — Buy it with Access

● Circle No. 347

COMPUTECH for Apple

Authorised dealer, service centre and system consultancy

SUCCESS BREEDS SUCCESS!

As authorised dealer and service centre for Apple computers we have acquired extensive experience of users' needs and the most cost effective means of satisfying them from the considerable resources of this popular and reliable machine. Over 1,000 of our financial accounting packages have been installed. In the process we have have detected areas of special need and opportunities for enhancing these resources. Our own manufactured hardware and system software have been produced to meet these requirements. As a result we have compatible products for all configurations of Apple II and ITT 2020 installations - and the new Apple /// !

Apple /// now on demonstration - systems from	**£1,645**
Pro-File 5 MB mass storage for Apple ///	**£2,256**
Computech mass storage for Apple II and Apple ///, up to 12 MB, from	**£1,950**

COMPUTECH SOFTWARE AND HARDWARE INCLUDES:

Payroll for 350 employees, 100 departments, all pay periods, printed payslips, approved year end documents, very quick and easy to use, **£375. Sales, Purchases** and **General Ledgers £295** each, detailed statements. **Job Costing** and **Group Consolidation** are amongst many and various applications of the **General Ledger** package, which supports values to totals of one thousand million accurate to a penny! Our **Utilities Disk** available like other packages in 13 sector or 16 sector format, is widely used for reliable, error checking, copying, including single drive, and the renowned **DPATCH** program beloved of programmers for **£20.** We have developed a **Terminal Utilities** package which enables Apple to Apple and Apple to mainframe communications with local processing and storage as well as Apple to host communications from the amazingly low price of **£130.** Our **Graphics Utilities** program for use with the **Microline** and **Epson** families of printers enable the plain paper production on low cost printers of high resolution screen pictures, graphs etc. - free with **Microlines** or **£30** separately. **Keyboard Driver** enables the use of our **Lower Case** adaptor with BASIC programs and **Applewriter Patches** supplied **FREE** with our character generator package (total cost **£50**) is separately available on disk with documents for **£10.** At the same price **CAI** (convert Apple pictures for ITT) makes binary high resolution picture files display properly on the ITT 2020. We sell the famous **Visicalc** for **£111** and have delivered systems using it to do amazing things like production control, shipping accounts and stocks and shares valuations! The versatile **Applewriter** word-processing package at only **£39,** especially employed with our **Lower Case Character Generator** is widely used by people who cannot type to produce word-perfect copy! Experience with Apple systems has led to the design and manufacture of compatible products with enhanced features at very favourable prices to satisfy users' needs. These include the **Diplomat Serial Interface** which has handshaking capability and switchable options (**£80**), the **Diplomat Parallel Interface** which enables the direct use of text and graphics with the **Microline** and **Epson** printers and is a complete 'plug in and go' item with gold-plated edge-connector at **£80** and has optional direct connection for **Centronics 730/737** printers. Our new **Diplomat Communications Card** at **£95** is a sophisticated peripheral especially suitable for Apple to mainframe communications at high speeds in full duplex mode with switch selectable bit rates and other options. The **Lower Case** adaptor is available for Apples (revision 7 and earlier) as well as ITT 2020, complete with diskette software for **£50**. It offers true descenders on screen and the £ sign. We also have an **Optional Character Generator** for the ever popular **Microline M80** at **£15**. This provides £ sign and improved digits and lower case characters with USASCII special symbols. Our price for the **Microline M80**, with graphics, 40, 80 and 132 characters per line, friction, sprocket and teleprinter feed, is only **£295,** amazing for this small, quiet reliable 'look alike' printer. Tractor option is **£40** and **Serial Adaptor £80**. The **Microline M82**, bidirectional printer with both parallel and serial input is only **£345,** it can have an optional 2K buffer, while the **Microline M83** full width adjustable tractor 120 cps printer with similar specification is only **£595.** Then for all computer users there is the unique **Micromux** which from **£800** provides up to 16 ports for simultaneous independent serial asynchronous communications! Telephone for data sheets or to arrange a demonstration or for the address of our nearest dealer. Please hurry - the demand for our products has been such that some have been temporarily out of stock. We offer the effective low cost solutions you need. **Prices exclude V.A.T., carriage and packing.**

COMPUTECH SYSTEMS

168, Finchley Road, London NW3 6HP. Tel: 01-794 0202

AGENTS THROUGHOUT THE UK AND OVERSEAS

● **Circle No. 104**

SUPERBRAIN

- 350K — 700K — 1.5MB — 6MB
- Twin Z80A's with 64K RAM
- 12" screen — 25 x 80 characters per line

HARD DISKS NOW AVAILABLE

3 meg; 6 meg; 12 meg;
Your existing Superbrain can be upgraded, prices from £3,300.

SUPERCHARGE YOUR SUPERBRAIN

Up to 5 times faster with:
- QD + ROM

More space — more features — more speed
- ZDOS gives extra 4K of memory & 25% faster screen handling
- true lower descenders for screen
- sleep option on drives.

SOFTWARE FOR YOUR SUPERBRAIN

Languages:
- Basic — Cobol — Fortran

Word Processing:
- WORDSTAR — SPELLBINDER etc

Accounts:
- EASI BUSINESS SYSTEMS — Integrated accounts — Sales/Purchase/ Nominal Ledgers. Invoicing — Stock control — payroll.

SPECIAL BUSINESS SYSTEM PRICES
Telephone for details.

PRINTERS

- Diablo 630
- Tec Starwriter
- Nec Spinwriter
- DRE 1226
- Epson range
- Okl range

from £350
ex-demo ANACOM £575*

TeleVideo® Systems

The Multi-User Family with the MmmOST Security . . .

- A family of multi-user systems — Z80A — CP/M — Starting from £2,300 — 1 meg. floppy — 10 meg. Winchester (floppy back up) — 23 meg. Winchester cartridge tape back up — up to 16 users per disk system which may be networked — will run your existing CP/M software, eg. Wordstar, Integrated Accounts etc. — languages BASIC, COBOL, FORTRAN etc.

apple & ITT2020

COMPLETE BUSINESS SYSTEMS

48K Apple system with 2 disk drives, printer and software: from under £2,000

Sales/Purchase/Nominal Ledgers — Payroll — Stock Control, etc, etc.

ACORN ATOM

ATOM KIT 8K ROM 2K RAM	£120	4K FLOATING POINT ROM (including 12K version)	£20
ASSEMBLED	£150	PRINTER DRIVE	£9
KIT 12K ROM 12K RAM	£220	LS 244 BUFFER	£2.50
ASSEMBLED	£250	COLOUR ENCODER	£19
1K RAM SETS	£5.00	MAINS PSU	£8

BRISTOL (0272) 428165
ELECTRONIC INFORMATION SYSTEMS (BRISTOL) LTD.,
91 ASHLEY DOWN ROAD,
BRISTOL BS7 9JT

MANCHESTER (092) 576 5082
AID LTD,
UNIT 3, LODGE DRIVE,
CULCHETH, NR WARRINGTON.

ALL PRICES EXCLUDE VAT AT 15% & DELIVERY

DAY 1 on-site maintenance contracts available.
FULL SOFTWARE SUPPORT & TRAINING

● Circle No. 348

For the best PET software...

COMMAND-O.....	For Basic IV CBM/PET, 39 functions with improved "Toolkit" commands	£59.95 + Vat
DISK-O-PRO....	For Basic II PET, adds 25 commands including Basic IV, in one 4K rom	£59.95 + Vat
KRAM.....	For any 32K PET/CBM for retrieving disk data by KEYED Random Access	£86.95 + Vat
SPACEMAKER IV	For any PET/CBM, mounts 1-4 roms in one rom slot, switch selection	£29.95 + Vat
" USER I/O	For software selection of up to 8 roms, in any two Spacemaker Quads	£12.95 + Vat
PRONTO-PET....	Soft/hard reset for 40-column PETs	£9.99 + Vat

SUPERKRAM, REQUEST & KRAM PLUS will be available shortly

We are sole UK Distributors for these products, which are available from your local CBM dealer, or direct from us by mail or telephone order. To order by cheque write to: Calco Software, FREEPOST, Kingston-upon-Thames, Surrey KT2 7BR (no stamp required). For same-day Access/Barclaycard service, telephone 01-546-7256. Official orders accepted from educational, government & local authority establishments

...at the best prices!

WORDPRO IV PLUS	RRP £395 less £98.75	= £296.25!
WORDPRO III PLUS	RRP £275 less £68.75	= £206.25!
WORDPRO II PLUS	RRP £125 less £31.25	= £93.75!
VISICALC	RRP £125 less £25.00	= £100.00!
TOOLKIT Basic IV	RRP £34 less £9.50	= £24.50!
TOOLKIT Basic II	RRP £29 less £7.25	= £21.75!

The items above are available by mail or telephone order at our Special Offer Price when purchased with any one of our software products. This offer is for a LIMITED PERIOD only. UK - ADD 15% VAT. OVERSEAS airmail postage - add £3.00 (Europe), £5.00 (outside Europe).

Calco Software

Lakeside House - Kingston Hill - Surrey - KT2 7QT Tel 01-546-7256

● Circle No. 349

ATARI SOFTWARE

At Long Last

A wonderful variety of ATARI Software is now available. See below for a sample of the exciting new games in stock.

DISK SOFTWARE

The Wizard & The Princess	£17.95
Mouseattack	£21.00
Jawbreaker	£16.95
Soft Porn Adventure (adults only!)	£16.95
Pool 1.5	£22.95

CASSETTE SOFTWARE

Temple of Apshai	£24.95
Datestones of Ryn	£12.95
Richochet	£12.95
Lords of Karma	£12.95
Tanktics	£15.00
Fastgammon	£12.95
Lunar Lander	£ 9.95

All prices are plus VAT, Postage & Packing Free.

Please write or ring us for a full software catalogue:

SBD SOFTWARE

15 Jocelyn Road, Richmond TW9 2TJ

Telephone: 01-948 0461. Telex: 22861

● Circle No. 350

INNOVATIVE
TRS 80-GENIE SOFTWARE
from the professionals

....a new, simple to use, moderately priced word processor

The introduction of a brand new word processor is a major event and AJEDIT is without doubt a major program. There are, however, quite a few Word Processors around and most of them are extremely good ones - why, therefore, another? The question is even more pertinent when it is known that we specifically commissioned the writing of it from an author of the status of Denville Longhurst of Enhanced Basic fame. The answer is that user feedback shows that a large number of customers do not need or want word processor programs which require a quantity of training before use. Scripsit, for instance, is an excellent program, but is complex to use; it even comes with a training course on tape. If one operator is dedicated to using the word processor then it makes sense to have her trained, and the more complex the program (so long as the complexity is accompanied by more and bigger functions) the better.

AJEDIT has been written for the user who needs a word processor intermittently, say three or four times a week. Its prime design criteria was ease of use - and just as importantly - ease of recollection of its commands. Take, for instance, the text editing commands - they are as close to the Basic Edit commands as possible, so that the user will remember them: To insert type I, to delete D, to take out three letters type 3D and so on.

Furthermore, AJEDIT has benefited from being written after a number of other word processors. The deficiencies in its predecessors are corrected in AJEDIT. For instance, any control characters can be outputted so that full advantage can be taken of the features of the particular printer being used. Disk directory access is available from within AJEDIT as is the killing of files on the disk. The FREE command and a number of other DOS commands can be carried out from within the program with a return to AJEDIT - with its text intact.

AJEDIT contains close to one hundred commands covering most word processor requirements. Dedicated printer commands for the Epson MX series and the Centronics 737 are included - again for ease of use of these two popular printers.

One of the big features of AJEDIT is the ability to "mail-merge". The facility is available whereby two special files are created, one containing names and addresses and a salutation. the other a standard letter or form. AJEDIT will call the address and salutation from one file and the letter from the other and thereby compile personalised letters. The salutation may be repeated in the body of the letter.

AJEDIT needs 48K and one disk minimum and is suitable for the TRS-80 Models I and III and the Video Genie Models I and II.

AJEDIT **£49.95**
Inclusive of V.A.T. and P. & P.

MOLIMERX LTD
A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391/223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [refundable] plus £1 postage.

● **Circle No. 351**

APPLE SOFTWARE

A.C.E. — A program line editor with macro facilities	£19.95 A48K
Akalabeth — An advanced fantasy role playing game	£22.95 M48K
Apple-Doc — Cross reference utility + Variable replacement	£22.95 A48K
Apple Panic — Chase little apples up and down ladders	£16.95 M48K
AppleWorld — Allows you to produce 3-D animated graphics	£38.95 M48K
Ascii Express II — A complete intelligent terminal package	£42.95 A48K
Asteron — The ultimate Asteroids replica game	£19.95 M48K
Autobahn — Road race game with sound and hi-res graphics	£14.95 M48K
Beer Run — Catch the Artesians before the Guzzlers and Bouncers catch you	£16.95 M48K
Both Barrels — 2 hi-res action games on one disk	£12.95 A48K
Castle Wolfenstein — An action adventure in hi-res graphics with speech	£18.95 M48K
Copts & Robbers — An adventure game in the tombs of ancient Egypt	£19.95 M48K
CPS Multifunction card — Serial, Parallel and Clock on one card	£183.95 Card
Cranston Manor — A new hi-res adventure like Wizard and the Princess	£19.95 M48K
Crossfire — Stop the aliens from taking over the city	£16.95 M48K
Cross-Ref — Cross reference Applesoft programmers utility	£14.95 A32K
Cyber Strike — 3-D hi-res action arcade game in space	£19.95 M48K
Dark Forest — An adventurous game of strategy and conquest for up to 6 players	£16.95 M48K
Dogfight — Hi-res jet combat game for 1 or 2 players	£18.95 M32K
Epoch — Hi-res 3-D shoot-up in space. Our favourite	£19.95 M48K
E-Z Draw 3.3 — The poor man's graphics tablet. Very easy to use	£28.95 M48K
EXPEDITER II — THE APPLESOFT COMPILER AT A LOW, LOW PRICE	£56.95 A48K
Falcons — The best Invaders style game for the Apple	£18.95 M48K
Fender Bender — Super car game in hi-res colour graphics	£14.95 M48K
Galaxy Wars — Colour graphics + Sound effects + Hi-res arcade style game	£13.95 M32K
Galactic Attack — A hi-res Star Trek type game	£19.95 M48K
Gamma Goblins — Yet another superb hi-res action game	£16.95 M48K
Genetic Drift — A departure from the normal arcade game. Great fun	£16.95 M48K
Hadron — A 3-D battle in the midst of a meteor field	£19.95 M48K
Higher Graphics — Hi-res picture drawing utility	£23.95 M48K
Hi-Res Cribbage — The title describes it. Even hear the pegs move	£14.95 M48K
HI-Res Soccer — English football for 1 or 2 players in hi-res	£16.95 M48K
Jawbreaker — Eat up the dots but watch out for the Gobblers	£16.95 M48K
KRAM — Fast and powerful Keyed Random Access Method for quick disk access	£58.95 M32K
LISA — The assembly language development system for professionals	£45.95 M48K
List Master — An excellent companion product to Apple-Doc	£22.95 M48K
Memory Management System — Enables you to put DOS on a RAM card	£29.95 M64K
Microsoft 16K Ram Expansion Card. Includes FREE Memory Management System	£114.95 Card
Missile Defence — Hi-res animation and sound arcade game	£16.95 M48K
Mission: Asteroid — Hi-res adventure in 21 colours. Save the World!!	£10.95 M32K
MultiBoot Upgrade — Upgrade 3.2 disks to boot under 3.2 or 3.3	£23.95 M48K
Mystery House — Hi-res adventure using over 100 pictures	£12.95 M48K
Norad — A hi-res simulation of an I.C.B.M. attack	£19.95 M48K
Olympic Decathlon — Long jump, high jump, hurdles plus much more	£17.95 M48K
Online — A new concept in dial-up software for the Apple	£59.95 A48K
Orbitron — Fight off enemy forces and avoid meteor showers	£14.95 M48K
Outpost — Save your space outpost from attack by enemy fighters	£16.95 M48K
Pascal Graphics Editor — Professional graphics editing package for Pascal	£49.95 M64K
Pegasus II — The latest in pub games now available for the Apple	£16.95 M48K
Phantoms Five — A fighter-bomber mission in 3-D real time graphics	£18.95 M48K
Pool 1.5 — Hi-res colour graphics pool table simulation. 4 games	£19.95 M48K
Pulsar II — 2 superb hi-res arcade games on one disk	£14.95 M48K
Raster Blaster — A very realistic full colour pinball simulation	£15.95 M48K
Sabotage — Shoot down helicopters and bombers in hi-res	£13.95 M48K
Shooting Gallery — Real-time simulation of a fairground gallery	£15.95 M48K
Shuffleboard — Real time hi-res simulation by the authors of Pool 1.5	£19.95 M48K
Sneakers — Waves of little creatures attack you in hi-res	£16.95 M48K
Softporn Adventure — An adventure for adults only	£16.95 M48K
Space Eggs — Hi-res super-fast arcade style game	£14.95 M48K
Space Quarks — Shoot down the quarks before they get you	£16.95 M48K
Space Warrior — Protect your shields from the dreaded drone RAM ships	£13.95 M48K
Star Avenger — A fast paced game of guerilla warfare in space	£19.95 M48K
Star Cruiser — Save yourself from the swooping aliens	£18.95 M48K
SuperGraphics — A 3-D game development system in colour	£23.95 M48K
SuperKRAM — As KRAM but with multi-key and multi-index	£99.95 M32K
SUPERSCRIBE II — WORD PROCESSOR. TRUE UPPER/LOWER CASE ON SCREEN	£73.95 M48K
TASC — An optimising Applesoft compiler from Microsoft	£129.95 A48K
The Dictionary — Checks spelling of any standard DOS text or binary file	£54.95 M48K
The General Manager — User-friendly hierarchial database package	£54.95 M48K
Threshold — Yet another fast action arcade style game	£21.95 M48K
Time Zone — The largest adventure ever. Hi-res colour graphics. 1,182 rooms	£54.95 M48K
Ulysses & The Golden Fleece — Another adventure like Wizard and the Princess	£19.95 M48K
Visicalc 3.3 — The 16 sector version with enhanced manual	£119.95 M48K
Visidex — Store and retrieve information by key words	£119.95 M48K
Visifile — A database package from the same stable as Visicalc	£149.95 M48K
Visiplot — A hi-res graphics graph plotting package	£94.95 M48K
Visiterm — Use your Apple as an on-line terminal	£89.95 M48K
Visitrend — Performs maths operations on time series data	£149.95 M48K
Wizard and the Princess — Hi-res adventure in 21 colours	£18.95 M48K
Wizardry — 3-D adventure. The best we have seen yet	£28.95 M48K
Z-Term — A full feature terminal package for the CP/M Apple	£65.95 M48K

A: Requires Applesoft in ROM M: Will run on any Apple

Please specify which DOS you require when ordering. If you don't see what you are looking for please give us a call. WE ALSO OFFER A BESPOKE SOFTWARE SERVICE WHICH IS SECOND-TO-NONE.

PRICES INCLUDE VAT AT 15%. Add 50p P+P for orders under £30 totally.

Please write or telephone for your free copy of our up-to-date software list.

Dealers inquiries invited. PERSONAL CALLERS BY APPOINTMENT ONLY PLEASE.

SPIDER SOFTWARE

Access

98 AVONDALE ROAD, SOUTH CROYDON, SURREY.

Tel: 01-680 0267 (24 hours a day — 7 days a week)

● Circle No. 352

DISC DRIVES AT UNBELIEVABLY LOW PRICES

SIEMENS FDD100-8 250/500 KBytes, 8" Single Sided, Single or double density £263.16

TANDON THINLINE™ TM848-2 500/1000 KBytes, 8" Double Sided, Single or double density, half thickness of standard drive, only 2.3", D.C. power only required 24VDC + 5VDC at 1.5 Amp £449.00

TANDON MINI WINCHESTER TM600 5 MBytes

FOR SUPER BRAIN
TM600 + controller + power supply, in case, wired and complete with 3.1DOS £1695.00

FOR S100
TM600 + controller + cables + CP/M 2.21. £1595.00

SOFTWARE:

From MicroPro	£	From Graham Dorian Software	£
WORDSTAR	270.00	Nominal Ledger	495.00
MAILMERGE	85.00	Sales Ledger	495.00
SPELLSTAR	135.00	Purchase Ledger	495.00
SUPERSORT	145.00	Stock Control	495.00
DATASTAR	195.00	Order Entry/Inv.	495.00
CALCSTAR	175.00 (new)	Job Costing	495.00
From Microsoft		The above include Source	
Basic 80	175.00	Code in CBASIC 2	
Basic Compiler	185.00		

EXTRA DISCOUNT

An extra discount of 5% may be deducted from the above prices if cash/cheque is sent with order. All the above prices exclude VAT at 15%

IRVINE BUSINESS SYSTEMS LTD
PO BOX 5, 10 NORTH VENNEL
BOURTREEHILL, IRVINE, AYRSHIRE KA11 1NE
TEL: 0294 218888

● Circle No. 353

io systems ltd.

A/D BOARD FOR NASCOM
- 8 input channels
- 30 miscrosec conversion
- Over voltage protection
- Prototyping area
- 8 bit resolution
- Sample and hold
- Full flat/interrupt control
- NASBUS compatible

Price £135 + 15% VAT (post free)

GRAPHICS BOARD FOR NASCOM
- 384(H) x 256(V) high resolution graphics display
- Fully bit mapped
- Full software control
- Mixed text and graphics
- NASCOM 2 or 4MHz NASCOM 1
- Graphics software supplied

Price £55 + 15% VAT (post free)

EPROM PROGRAMMER
- Programs 3 rail: 2708/2716
- Single rail: 2508/2758, 2516/2716, 2532/2732
- Software supplied for Read/Program/Verify
- Can be used with other machines with 2 parallel ports

Price £63 + 15% (post free)

DUNCAN
- Fast real time interpreter/control language for NASCOM 1 or 2 (please specify)

Price £12 + 15% VAT (post free)

MEMORIES
- 4116-150ns 95p each + 15% VAT (min order 8)
- 64K-200ns £10 each + 15% VAT

MONITORS
- BMC 12" green phosphor — 18MHz

Price £175 x 15% VAT (carriage paid)

6 Laleham Avenue, Mill Hill, London NW7 3HL
Tel: 01-959 0106

● Circle No. 354

ELECTRONIC GAMES

COLOUR CARTRIDGE T.V. GAME

SEMI-PROGRAMMABLE T.V. GAME
+ 4 Cartridges + Mains Adaptor
Normal Price £73
NOW REDUCED TO: £39.50 inc VAT

DATABASE T.V. GAME

FULLY PROGRAMMABLE CARTRIDGE T.V. GAME
14 Cartridges available
Normal Price £87.86
NOW REDUCED TO: £59 inc VAT

ATARI T.V. GAME

The most popular T.V. Game on the market with a range of over 40 cartridges including SPACE INVADERS with over 112 games on one cartridge. **£95.45** inc VAT

SPACE INVADERS

Hand-held Invaders Games available £19.95
+ Invaders Cartridges available to fit
ATARI RADOFIN ACETRONIC PHILIPS G7000
+ Cartridges also available for
MATTEL TELENG/ROWTRON/ DATABASE/INTERTON

CHESS COMPUTERS

MANY UNITS ARE COVERED BY THE EXCLUSIVE SILICA SHOP 2 YEAR GUARANTEE

We carry a range of over 15 different Chess computers:

Electronic Chess	£29.95
Chess Traveller	£39.95
Chess Challenger 7	£79.00
Sensory 8	£119.00
Sensory Voice	£259.00

SPECIAL OFFERS:
VOICE CHESS CHALLENGER
Normal Price £245 NOW £135.00
SARGON 2.5/BORIS 2.5
Normal Price £273.70 NOW £199.95
All prices include V.A.T

TELETEXT ADD-ON ADAPTOR £199 inc VAT

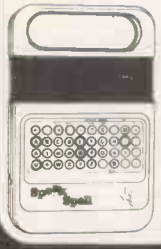
THE RADOFIN TELETEXT ADD-ON ADAPTOR

Plug the adaptor into the aerial socket of your colour T.V. and receive the CEEFAX and ORACLE television information services.

THIS NEW MODEL INCORPORATES:

- Double height character facility
- True PAL Colour
- Meets latest BBC & IBA broadcast specifications
- Push button channel change
- Unnecessary to remove the unit to watch normal TV programmes
- Gold-plated circuit board for reliability
- New SUPERIMPOSE News Flash facility

SPEAK & SPELL



Normal Price £49.95
NOW REDUCED TO: £39.50 inc VAT

Teach your child to spell properly with this unique learning aid. Fully automatic features and scoring. Additional word modules available to extend the range of words.

ADDING MACHINE OLYMPIA HHP 1010

Normal Price £57.21
NOW REDUCED TO: £34 inc VAT

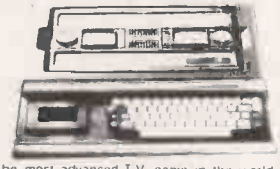
Uses ordinary paper!
No need to buy expensive thermal paper!
Fast add listing PRINTER CALCULATOR 2 lines per second, 10 digit capacity
Uses normal adding machine rolls. Battery or mains operated.
Size 9¼"x4¾"x2⅜"
(Mains adaptor extra)

24 TUNE ELECTRONIC DOOR BELL

Normal Price £19.70
NOW REDUCED TO: £12.70 inc VAT

Plays 24 different tunes with separate speed control and volume control. Select the most appropriate tune for your visitor, with appropriate tunes for different times of the year!

MATTEL T.V. GAME



The most advanced T.V. game in the world 20 cartridges available. Add-on KEYBOARD coming soon to convert the **£199.95** inc VAT MATTEL to a home computer with 16K RAM, fully expandable and programmable in Microsoft Basic. Other accessories will be available later in the year.

HAND HELD GAMES

EARTH INVADERS

These invaders are a breed of creature hitherto unknown to man. They cannot be killed by traditional methods — they must be buried. The battle is conducted in a maze where squads of aliens chase home troops. The only way of eliminating them is by digging holes and burying them **£23.95** inc VAT

HAND HELD GAMES

GALAXY 1000

The 2nd generation Galaxy Invader. The invaders have re-grouped and have a seemingly endless supply of spacecraft whilst the player's arsenal is limited to just 250 missiles to be launched from 3 missile stations. You have to prevent the invaders landing or from destroying your home defences. **£19.95** inc VAT

THE OLYMPIA — POST OFFICE APPROVED TELEPHONE ANSWERING MACHINE

WITH REMOTE CALL-IN BLEEPER

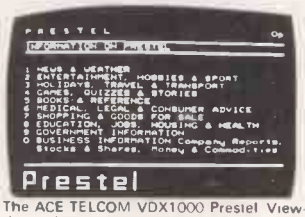
This telephone answering machine is manufactured by Olympia Business Machines, one of the largest Office Equipment manufacturers in the U.K. It is fully POST OFFICE APPROVED and will answer and record messages for 24 hours a day. With your remote call-in bleeper you can receive these messages by telephone wherever you are in the world. The remote call-in bleeper activates the Answer/Record Unit, which will at your command repeat messages, keep or erase them, and is activated from anywhere in the world, or on your return to your home or office. The machine can also be used for message referral, if you have an urgent appointment, but are expecting an important call, simply record the 'phone number' and location where you can be reached. With optional extra bleepers (£13 each) this facility can be extended to colleagues and members of the family. Using a C90 standard cassette you can record as many as 45 messages. The announcement can be up to 16 seconds long and the incoming message up to 30 seconds long.

The machine is easy to install and comes with full instructions. It is easily wired to your junction box with the spade connectors provided or alternatively a jack plug can be provided to plug into a jack socket. Most important, of course, is the fact that it is fully POST OFFICE APPROVED.

The price of £135 (inc. VAT) includes the machine, an extra-light remote call-in Bleeper, the microphone message tape, A.C. mains adaptor. The unit is 9¾"x6"x2½" and is fully guaranteed for 12 months. The telephone can be placed directly on the unit — no additional desk space is required.

£135 inc VAT

PRESTEL VIEWDATA



The ACE TELCOM VDX1000 Prestel Viewdata adaptor simply plugs into the aerial socket of your television and enables you to receive the Prestel Viewdata service in colour or black & white

Features —

- Simplified controls for quick, easy operation
- Special graphics feature for high resolution
- State-of-the-art microprocessor controller
- Standard remote telephone keypad with Prestel keys * #
- Auto dialler incorporated for easy Prestel acquisition
- True PAL colour encoder using reliable IC chroma filter and dela line incorporated for minimum picture interference maximum fidelity
- Includes convenient TV — Prestel switchbox
- Easily connected to standard home or office telephone lines
- Fully Post Office approved

SPECIAL PRICE **£228.85** inc VAT

FOR FREE BROCHURES –TEL: 01-301 1111

For free illustrated brochure and reviews on our range of electronic games, please telephone 01 301 1111. Free delivery service available. To order by telephone please quote your name address and ACCESS/BARCLAYCARD number and leave the rest to us. Post and packing Free of Charge Express 48hr delivery service available.

- CALLERS WELCOME — Demonstrations daily at our Sidcup shop, open from 9am-6pm Monday Saturday (Early Closing Thursday 1pm — Late Opening Friday 8pm)
- 2 YEAR GUARANTEE — All goods are covered by a full year's guarantee and many are further covered by our exclusive Silica Shop 2 year Guarantee
- MONEY BACK UNDERTAKING — If you are unsatisfied with your purchase and return it within 7 days we will give you a full refund.
- AFTER SALES SERVICE — Available on all machines out of guarantee
- COMPETITIVE PRICES — We are never knowingly undersold
- HELPFUL ADVICE — Available on the suitability of each machine
- CREDIT FACILITIES — Full credit facilities available over 12, 24 or 26 months at competitive rates of interest
- PART EXCHANGE SCHEME — available on second hand machines
- CREDIT CARDS WELCOME — Access, Barclaycard, Diners Club, American Express

SILICA SHOP LIMITED PC 3/82
1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX
Telephone: 01-301 1111 or 01-309 1111

SILICA SHOP

235

MORE FROM MICROSOURCE

MICROSOURCE sells mainly APPLE software, peripherals and books. We cannot list all our products in a short space, so look in back issues and other magazines. We can get hold of most of your wants quickly, and at a competitive price. We specialise in the specials, what you need but cannot get elsewhere. Write or ring for a quote or more information — you can't lose!

BOOKS

ALL ABOUT APPLESOFT

The American User Group CALL A.P.P.L.E. have reprinted some of their own articles together with some from other sources, and then had specially written the ones that were missing to give an excellent compilation of the ins and outs of APPLESOFT in one volume. Contents include:-

—APPLESOFT FROM BOTTOM TO TOP — a guided tour through APPLESOFT both a description and hundreds of listings and programs and subroutines to help you get more from your APPLE.

—MAKING BASIC BEHAVE — a structured approach to BASIC with numerous listings of ideas and subroutines for formatting, file handling etc.

—INTERNAL ENTRY POINTS — a guide to the various machine code routines in APPLESOFT that you could use in your own programs. Not only where they are but how to use them. A companion to "WHAT'S WHERE IN THE APPLE".

—NOTES ON HI-RES GRAPHICS ROUTINES — a specific article on the use of the HI-RES GRAPHICS routines to help you to write machine code graphics.

—AMPLIFYING APPLESOFT — adding extensions to the language as well as methods to get the best mileage out of APPLESOFT, again with lots of listings.

—PLUS lots more, print using, splitting programs, comparing programs etc, etc.

—IN SHORT a must for all serious APPLESOFT PROGRAMMERS. £9.95

OTHER BOOKS AVAILABLE

WHAT'S WHERE IN THE APPLE (Luebbert) — the atlas of peeks and pokes and machine code entry points £9.95

BENEATH APPLE DOS (WORTH/LECHNER) detailed look inside DOS and how the disk system works £11.95

COMPUTER GRAPHICS PRIMER (WAITE) £10.50

APPLESOFT LANGUAGE (BLACKWOOD) £8.20

APPLE BASIC FOR BUSINESS (PARKER/STEWART) £12.50

APPLE II USERS GUIDE £11.20

AND . . .

GRAPHICS SOFTWARE FOR MICROCOMPUTERS (KORITES) £15.95

A guide to programming graphics from point plotting to 3-D perspective and Hidden line elimination, with theory and Mathematics. Also suitable for RESEARCH MACHINES 380Z. (Disks of the software from this book for the APPLE also available, you don't have to type the listings in the book! BASIC £15.95, Machine code (2 disks) £18.95.

VEROBOARDS for making your own extension cards. These cards have been designed by VERO especially for the APPLE. A MUST if you are designing you own cards for the extension slots. (If you have a design you think might be worth marketing as a kit or ready made, let us know!) £8.50

DISKS! DISKS! DISKS!

We can offer ACCUTRACK disks at very attractive prices:-
EACH BOX OF 10 INCLUDES A FREE LIBRARY CASE

1 Box of 10	£15.65 + VAT
2+ Boxes of 10	£14.80 + VAT per box
10 Boxes of 10	£14.00 + VAT per box

(ALL PRICES INCLUDE P&P)

DIGITEK PAL COLOUR CARD — If you have seen the APPLE COLOUR CARD working on a TV you will notice a series of wavy lines moving across the screen and giving you a picture which is not very clear. The DIGITEK card not only overcomes this but also gives you crisper and better colour. £110

DIGITEK 16K RAM CARD — expand your APPLE to 64K. Plugs into SLOT 0, without a flying lead. Uses best quality RAM chips, cutting down on power consumption. Run PASCAL, load INTEGER so that you have the equivalent of an INTEGER ROM CARD. VITAL for using VISICALC with DOS 3.3 — did you realise the DOS 3.3 version takes up more memory and you actually have less space than you had available on the 3.2 version if you do not use a RAM card. No significant loss over 3.2 version with a RAM card though, compared with 3.3 version with RAM card. £95

NEW! NEW!

RAMPLUS BOARD (NOT ROMPLUS!) from Mountain Computer, expand your APPLE to 80K with two banks of 16K RAM, hardware or software switchable. Provides all APPLE LANGUAGE CARD functions plus an extra 16K of RAM. Lower power drain than a normal RAM card. £120

THE ENHANCER II — allows words or phrases to be defined at the touch of a key! Allows you to continue typing whilst the APPLE is busy doing other things; create a new keyboard layout with a different plug in chip; enhances the use of the APPLE for WORD PROCESSING, SECURITY systems etc etc. Gives upper/lower case on revision 7 or later APPLEs. £100

SPECIAL SOFTWARE

As well as being able to get almost any existing APPLE SOFTWARE or peripheral quickly, we have a team of writers producing the software that we, as users ourselves, wish was available. This month's new offering is:-

BUSINESS BASIC

Now you can have APPLESOFT with the features APPLE left out.
—Formatted output
—Programmable TAB fields
—Bi-Directional Scrolling
—INPUT ,;: in strings
—DISK store/recall commands giving 3 fold speed increase and up to 3 fold space reduction
—Direct access to disk sectors REQUIRES A 16K RAM card for use. £22
—'HELP' command for debugging
—'SCREEN' or 'PAGE' output
—INCLUDES the MINI ASSEMBLER

ALL PRICES INCLUDE VAT UNLESS SPECIFIC MENTION IS MADE. ALL PRICES INCLUDE P&P

MICROSOURCE
Tel: Park Street (0727) 72917

1 Branch Road, Park Street St. Albans.

● Circle No. 356

Save your time on paperwork and calculations

Visit The LONDON MICRO CENTRE to see word processing and business programs in action.

The Centre stocks a full range of software packages, but experience has shown that programs should normally be tailored to meet the client's particular needs.

We are main SUPERBRAIN, SORCERER and APPLE dealers. We can provide any printer to fit these computers.

You can rent a word processor and a micro system from £12.90 per week.

Contact us today for further information

The LONDON MICRO CENTRE
47 Lower Belgrave Street
LONDON SW1
Telephone: 01-730 8791

Open evenings and weekends

The LONDON MICRO CENTRE Ltd – An **EMG** Company

● Circle No. 357

DON'T BUY A MICRO COMPUTER

unless

- it has a seven year maintenance guarantee*
- it is backed by at least 10 years computer manufacturing experience*
- it has nationwide field maintenance and support
- it provides the basic software packages — word processing, payroll, general acounting, stock control, order processing — at least!
- it "grows" with you and is not rendered obsolete a few months later when you want to expand your computer facilities.
- it offers you a 'minimum interruption plan' in the event of a breakdown. Will the supplier 'swop' over your micro-computer to keep you going while your own is being repaired?
- the supplier can provide the names of existing micro users who are satisfied with the operation of their computer systems
- it is backed by a multi million £ group who will support you if your supplier goes out of business*
- it is British based

You know your business, the micro computer salesman knows his. You have to decide whether it completes the job you have in mind.

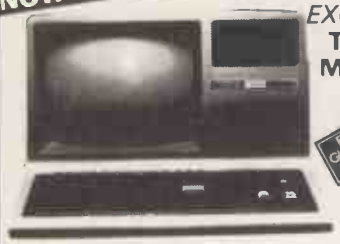
digico
DIGICO Limited
Computer Manufacturer
Letchworth and Leeds
Tel: 78172 and 486688

*Ask for a director's personal guarantee if you are dealing with a new or small company. If they won't back their product, why should you?

● Circle No. 358

NOW IN STOCK

THE NEW & EXCITING TRS80 MODEL III



EXTENDED GUARANTEE BY COMPUCARE

48K
£599 + VAT

The Radio Shack TRS 80™ Model III is a ROM-based computer system consisting of:
- A 12-inch screen to display results and other information
- A 65-key console keyboard for inputting programs and data to the Computer
- A Z-80 Microprocessor, the "brains" of the system
- A Real-Time Clock
- Read Only Memory (ROM) containing the Model III BASIC Language (fully compatible with most Model I BASIC programs)
- Random Access Memory (RAM) for storage of programs and data while the Computer is on (amount is expandable from "16K" to "48K", optional extra)
- A Cassette Interface for long-term storage of programs and data (requires a separate cassette recorder, optional extra)
- A Printer Interface for hard-copy output of programs and data (requires a separate line printer, optional extra)
- Expansion area for upgrading to a disk-based system (optional extra)
- Expansion area for an RS-232-C serial communications interface (optional extra)

All these components are contained in a single moulded case, and all are powered via one power cord.

Disc Drives Kit with 2x40 Track Drives — **£599** + VAT
Disc Drives Kit with 2x80 Track Drives — **£729** + VAT

HITACHI PROFESSIONAL MONITORS

EXTENDED GUARANTEE BY COMPUCARE

9" — ~~£129~~ **£99.95**
12" — ~~£199~~ **£149** } + VAT

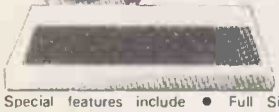
- **Reliability** Solid state circuitry using an IC and silicon transistors ensures high reliability.
- **500 lines horizontal resolution** Horizontal resolution in excess of 500 lines is achieved in picture center.
- **Stable picture** Even played back pictures of VTR can be displayed without jittering.
- **Looping video input** Video input can be looped through with built-in termination switch.
- **External sync operation** (available as option for U and C types)
- **Compact construction** Two monitors are mountable side by side in a standard 19-inch rack.

NEW

ACORN ATOM

UNIQUE IN CONCEPT — THE HOME COMPUTER THAT GROWS AS YOU DO

Fully Assembled **£157.50** + VAT inc. PSU



EXTENDED GUARANTEE BY COMPUCARE

Special features include
- Full Sized Keyboard
- Assembler and Basic
- Top Quality Moulded Case
- Optional High Resolution Colour Graphics
- 6502 Microprocessor

THE EPSON MX SERIES

EXTENDED GUARANTEE BY COMPUCARE

- 80/132 Column
- Centronics Parallel
- Bi-directional
- Upper & lower case
- True Descenders
- 9x9 Dot Matrix
- Condensed and Enlarged Characters
- Interfaces and Ribbons available

MX80T £339 + VAT
MX80F/T £389 + VAT

EXTENDED GUARANTEE BY COMPUCARE

Microline 83 & 82 NOW IN STOCK

NEW

MICROLINE 80 £289 + VAT

- 80 cps Uni-directional
- Small size: 342 (W) x 254 (D) x 108 (H) mm.
- 160 Characters, 96 ASCII and 64 graphics
- 3 Character sizes: 40, 80 or 132 chars/line
- Friction and Pin Feed
- Low noise: 65 dB
- Low weight: 6.5 kg

INTRODUCING THE NEW SHARP MZ-80B

NEW

EXTENDED GUARANTEE BY COMPUCARE

£999 + VAT

- 4 Mhz Z-80CPU
- Dynamic RAM
- 2K ROM
- BASIC is provided
- High Resolution Graphics
- 9" High Focus Green Display
- Upper and Lower Case
- 80/40 Characters x 25 line display
- Electro Magnetic Cassette Deck included
- ASC11 Keyboard
- Numeric Keypad
- Sound Output
- Built-in Clock and Music.

Available Soon-Discs, Printers and other Accessories.

DUE TO IMMENSE POPULARITY SALE CONTINUED

EUROPE'S FASTEST SELLING ONE BOARD COMPUTER

COMPUKIT UK101

★ 6502 based system best value for money on the market. ★ Powerful 8K Basic Fastest around ★ Full Qwerty Keyboard ★ 1K RAM Expandable to 8K on board. ★ Power supply and RF Modulator on board. ★ No Extras needed Plug-in and go ★ Kansas City Tape Interface on board. ★ Free Sampler Tape including powerful Dissassembler and Monitor with each Kit. ★ If you want to learn about Micros, but didn't know which machine to buy then this is the machine for you

KIT ONLY **£99.95** + VAT
Fully Assembled — **£149** + VAT
} PLUS £4.60 Post & Packing

WE ARE NOW STOCKING THE APPLE II AT REDUCED PRICES

AUTOSTART EURO PLUS

EXTENDED GUARANTEE BY COMPUCARE

48K
£649 + VAT

Getting Started APPLE II is faster, smaller, and more powerful than its predecessors. And it's more fun to use too because of built-in features like:
- BASIC The Language that Makes Programming Fun.
- High-Resolution Graphics (in a 54,000 Point Array) for Finely-Detailed Displays
- Sound Capability that Brings Programs to Life.
- Hand Controls for Games and Other Human-Input Applications.
- Internal Memory Capacity of 48K Bytes of RAM, 12K Bytes of ROM; for Big-System Performance in a Small Package.
- Eight Accessory Expansion Slots to let the System Grow With Your Needs.

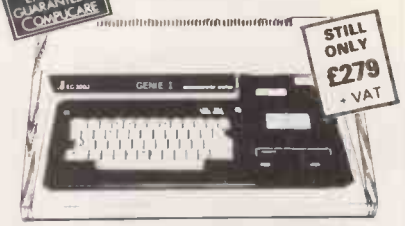
You don't need to be an expert to enjoy APPLE II. It is a complete, ready to run computer. Just connect it to a video display and start using programs (or writing your own) the first day. You'll find that its tutorial manuals help you make it your own personal problem solver.

INTRODUCING THE NEW GENIE

Ideal for small businesses, schools, colleges, homes, etc. Suitable for the experienced, inexperienced, hobbyist, teacher, etc.

GENIE I

EXTENDED GUARANTEE BY COMPUCARE



STILL ONLY **£279** + VAT

NOW **INCLUDED:** Sound, Upper and lower case, Extended BASIC and Machine Code enabling the Writing and Execution of Machine Codes Programming direct from Keyboard.
16K RAM. 12K Microsoft BASIC
Extensive Software Range.
Self-Contained PSU UHF Modulator Cassette. External Cassette Interface. Simply plugs into TV or Monitor. Complete and Ready to Go. Display is 6 lines by 32 or 64 Characters Switchable. 3 Mannuals included, Users Guide, Beginners Programming and BASIC Reference Mannual. BASIC Program Tape Supplied. Pixel Graphics.

GENIE II

EXTENDED GUARANTEE BY COMPUCARE

£299 + VAT

The **NEW GENIE II** an ideal Business Machine. 13K Microsoft BASIC in ROM. 71 Keyboard. Numeric Keypad. Upper & Lower Case. Standard Flashing Cursor. Cassette Interface 16K RAM Expanded externally to 48K.

GENIE I & II EXPANSION UNIT WITH 32K RAM £199 + VAT

PARALLEL PRINTER INTERFACE CARD
£35.00 + VAT

TEAC DISK DRIVES

EXTENDED GUARANTEE BY COMPUCARE

- TEAC FD-50A has 40 tracks giving 125K Bytes unformatted single density capacity.
- The FD-50A can be used in double density recording mode.
- The FD-50A is Shugart SA400 interface compatible.
- Directly compatible with Tandy TRS80 expansion interface.
- Also interfaces with Video Genie, SWTP, TRS80, North Star Horizon, Superbrain, Nascom, etc, etc
- Address selection for Daisy chaining up to 4 Disks.
- Disks plus power supply housed in an attractive grey case.

40 TRACK
Single Disk Drive **£225** + VAT — Double Disk Drive **£389** + VAT

77 TRACK
Single Disk Drive **£299** + VAT — Double Disk Drive **£499** + VAT

"Europes Largest Discount Personal Computer Stores"

Delivery is added at cost. Please make cheques and postal orders payable to **COMPSHOP LTD.**, or phone your order quoting **BARCLAYCARD, ACCESS, DINERS CLUB** or **AMERICAN EXPRESS** number.

MAIL ORDER AND SHOP: **CREDIT FACILITIES ARRANGED** — send S.A.E. for application form.
14 Station Road, New Barnet, Hertfordshire, EN5 1QW *(Close to New Barnet BR Station — Moorgate Line).*
Telephone: 01-441 2922 (Sales) 01-449 6596 Telex: 298755 TELCOM G
OPEN (BARNET) — 10am - 7pm — Monday to Saturday

NEW WEST END SHOWROOM:
311 Edgware Road, London W2. Telephone: 01-262 0387
OPEN (LONDON) — 10am - 6pm — Monday to Saturday
IRELAND: 19 Herbert Street, Dublin 2. Telephone Dublin 604165

TELEPHONE SALES
OPEN 24 hrs. 7 days a week
01-449 6596

BARCLAYCARD VISA

● Circle No. 359

CITY MICROSYSTEMS LIMITED

65 LONDON WALL, LONDON EC2M 5TU
01-588 7272

SUPERBRAIN

320K, 680K and 1.5MB Diskdrives.
Full graphics available.
Wide range of standard packages.

TELEVIDEO SYSTEMS

Multi-user, multi-task, multi-processor, televideo reliability with complete expandability.
One to sixteen users.

VIDEO GENIE
with VISICALC

Complete system £1275, inc. Computer, Monitor, Expander, 1-disk drive printer and Software.
Vast library of standard software.

Complete business accounting systems from £2000. Word processors from £1420

ADVICE, TRAINING AND MAINTENANCE

ALL YOUR COMPUTER REQUIREMENTS READILY AVAILABLE

IN THE CENTRE OF THE CITY — LONDON EC2

VISITORS TO OUR OFFICES MOST WELCOME 10.30am-4.30pm

● Circle No. 360

WORDSWORTH

☆ from PROSOFT, Hollywood, CA ☆
☆ for the TRS-80 Models I and III ☆

6 Grant Road
Banchory
Kincardineshire
AB3 3UR
Banchory (03302) 4168

Professional Word Processing

Powerful editing and formatting features formerly available only on large IBM Time Sharing computers. Full Screen Editing, Typeahead, Headings, Pagination, Text Centring, Global Search and Change, Table of Contents and Indexing.

PLUS: underlining, $_{sub}$ scripts, ^{super} scripts and **double-width**

Proportional font right-margin justification on 737, 739, LP IV, DW II, all 12 MX-80 fonts + underlining, italics on the Graftrax-80, and supports Diablo, Microline and Anadex printers. If your printer is capable, Newscript can help you!

160 pages of CLEAR documentation will help you to get the best from your printer, whether you use TRSDOS, NEWDOS, NEWDOS/80, LDOS or DOSPLUS. Requires 48K TRS-80 with one disk drive. Specify Model I or III.

NEWSCRIPT only £69.95
NEWSCRIPT with MAILING LABELS £79.95

FASTER (analyses Basic programs to improve execution times)
£17.95 Model I or III on cassette

QUICK COMPRESS (removes blanks and REM's) £12.95 cassette
FASTER and QUICK together £27.95

All prices are totally inclusive. SAE for full details
We accept Cheques, ACCESS or Postal Orders

● Circle No. 361

CRYSTAL ELECTRONICS
CC ELECTRONICS

FOR YOUR SHARP MZ80K CP/M 2.21 (XTAL)

BASIC CP/M FACILITIES INCLUDE:

- Dynamic file management Fast assembler
- General purpose editor • Advanced debugging utility

YOUR SHARP CP/M 2.21 (XTAL) PACKAGE INCLUDES:
• Hardware modification (if fitted by a SHARP dealer does NOT break the guarantee) • SHARP CP/M 2.21 (latest version) on disc • XTAL Monitor and Operating system • 7 Digital Research manuals • 12 months guarantee and up-dates (on all our products)

CP/M 2.21 (XTAL) FROM £150 + VAT

Ask your SHARP dealer for further details or contact CRYSTAL ELECTRONICS

CP/M SOFTWARE HOUSES—XTAL CAN HELP YOU ESTABLISH YOUR SOFTWARE ON THE SHARP.

XTAL BASIC (SHARP)

Takes 5K less memory, has all the features of SHARP BASIC PLUS Multi dim strings, error trapping, logical operators, machine code monitor, more flexible peripheral handling, improved screen control, increased list control, auto run, If..then..else—and it doesn't stop there—it grows. You can extend the commands and functions at will—10K, 12K, 16K, BASIC?. SHARP to XTAL BASIC conversion program is included. **£40 plus VAT.**

Bi-directional serial board for your SHARP RS232 compatible 150 Baud to 2400 Baud adjustable. <5,6,7,8 Bit words, plugs into MZ80I/O **£99.50 plus VAT.** Includes software for bi-directional use in XTAL BASIC, software for using SHARP BASIC with serial printer and self-diagnostic software for testing Baud rate etc.

Members of Computer Retailers Association & Apple Dealers Association

Shop open 0930—1730 except Saturday & Sunday

40 Magdalene Road, Torquay, Devon, England. Tel: 0803 22699

Access and Barclaycard welcome

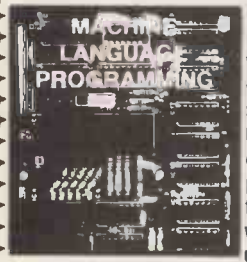
COMPUTERS AND COMPONENTS

● Circle No. 362

MACHINE LANGUAGE MADE SIMPLE ZX80 AND ZX81

This new book is a must for any **SINCLAIR** user who wants to make full use of his **SINCLAIR ZX80** and **ZX81.** Go beyond Basic into the world of **MACHINE LANGUAGE PROGRAMMING** and open computer horizons you never thought possible! Learn how to use the **SINCLAIR** computer's own language and finally find out what PEEK and POKE is all about!

MORE COMPUTING POWER IN LESS SPACE! FASTER RUNNING PROGRAMS!



Written for the complete beginner as well as for the experienced **SINCLAIR** user, **MACHINE LANGUAGE MADE SIMPLE** has over 120 pages packed with programming techniques, hints and tips.

WRITE YOUR OWN MACHINE LANGUAGE PROGRAMS...

• USEFUL BASIC PROGRAM TO EDIT MACHINE LANGUAGE • COMPLETE DESCRIPTION OF THE INSTRUCTIONS GROUPED BY SUBJECT AND BY USEFULNESS • NUMEROUS SAMPLE MACHINE LANGUAGE ROUTINES DESIGNED SPECIFICALLY FOR THE SINCLAIR 80 & 81 • SIMPLE EASY TO USE LOOK UP TABLES.

£8.95 (plus 50P p&p)

Please send me ..... copies **MACHINE LANGUAGE MADE SIMPLE FOR YOUR ZX80 & ZX 81.**

Orders to: Melbourne House Publishers, 131 Trafalgar Rd, London SE10

Correspondence: Glebe Cottage, Glebe House, Station Rd, Cheddington, Leighton Buzzard, Bedfordshire LU7.

Please enclose cheque or P.O. for £9.45 per copy. Orders outside the UK £9.95.

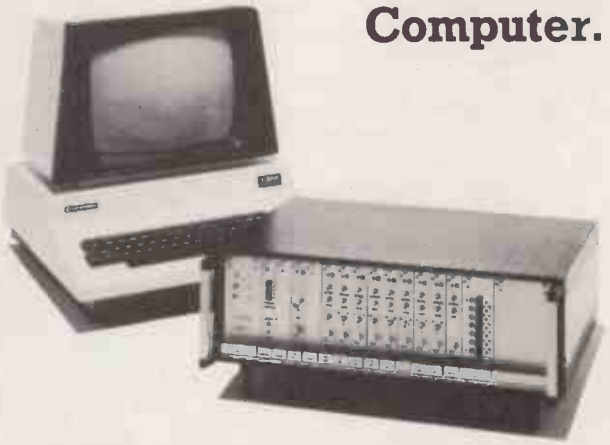
NAME .....

ADDRESS PC3/82

● Circle No. 363

MICROLINK MICROLINK MICROLINK

The MICROLINK Interface for your Commodore or Hewlett Packard Computer.



The MICROLINK interface has been designed for use in laboratory environments where acquisition and processing of data from a variety of sources is required. MICROLINK is a modular system consisting of a mainframe incorporating the IEEE-488 interface and a power supply, and a cabinet holding upto 17 modules–this means that the interface can be configured for your precise requirements.

Modules for signal acquisition:

AN-1, AN-1D	single-ended and differential analogue voltage conditioning modules.
A-8D, A-10D	8 and 10 bit analogue to digital converters.
HSC, HSM	high speed clock and multiplexer where rapid sampling is required (up to 10 kbytes/sec).

Modules for experimental control:

RR-8, HDR-4	reed and heavy duty relay outputs.
CC-8	8 contact closure or logic level inputs.
UDC	up/down counter (for counting logic pulses).

Modules for data collection from instruments:

BCD-8	8 decade BCD input.

Modules for signal generation or displays:

8D-A	8 bit digital to analogue converter.
SCOPE	2 channels + trigger for oscilloscope displays.
8D-XY	2 channels + pen lift relay for analogue XY plotter.

Modules for specialist applications:

TIM	millisecond timing.
HR	heart rate monitoring.
NHI	neural pulse histogram data collection.

Biodata

Write or telephone with details of your application and we will be pleased to quote for the appropriate configuration.

6 Lower Ormond St.
Manchester M1 5QF. U.K.
Telephone:
061-236 1283

MICROLINK MICROLINK MICROLINK

● Circle No. 374

If you have a PET and teach and assess keyboard skills then you need . . .

TYPESPEED

It allows you to:

- measure and record operators speed and accuracy
- improve performance by providing feedback on errors — audibly as they occur
- printout results, giving —
  test number
  operators name
  total words typed
  total time taken in minutes and seconds
  typing speed in words/min and keystrokes/min
  total number of errors
- create your own test texts — unlimited numbers of texts easily produced to your requirements
  ** 5 demonstration texts provided free **
- texts may contain for example, 4 full (A4 size) pages of text
  complete formatted letters
  lists of numbers
  dummy program listings

Requirements: cbm 8032 microcomputer (80 column) basic 4.0
cbm 8050 dual drive floppy disc unit dos 2.5
epson mx80 printer or similar

Clear and detailed user manual supplied with 2 discs holding 2 programs and 5 texts

Send only £38.50 including P&P to:

ABACUS PROGRAMS
186 ST. HELENS AVE. SWANSEA. TEL: (0792) 50282

● Circle No. 366

Metal cased 9"

CROFTON MONITOR

10 MHZ Bandwidth
P4 Standard
£59.50 + VAT (£68.42)
plus carriage £3.00
For P31 (green) high resolution tube add £12.50 + VAT (£14.38)

Plastic cased 12"

NEW PRINCE MONITOR

High resolution
24 MHZ Bandwidth
P31 (green) Standard
for only
£78.00 + VAT
(£89.70) plus
carriage £3.00

ALL MAJOR CREDIT CARDS ACCEPTED — Small surcharge

CROFTON ELECTRONICS LTD
35 Grosvenor Road, Twickenham, Middx TW1 4AD
01-891 1923/1513

● Circle No. 365

NEWBURY

Sharp operators go to NEWBURY

SHARP

NEWBURY LIMITED
3 Arnhem Road,
Newbury, Berkshire. Tel: (0635) 48864.

First Floor Offices, Tivoli Centre, Coventry Road, Birmingham. Tel: (021) 707 7170
220/222 Stockport Road, Cheadle Heath, Stockport, Manchester. Tel: (061) 4912290

● Circle No. 366

SHARP

SPECIAL OFFER

MZ80K

48K

£395 INC VAT

TANTEL Prestel Adaptor **£184.95**

apple computer Sales and Service

BETTER PRICES!!

APPLE][PLUS

APPOINTED DEALERS
LEVEL 1 SERVICE CENTRE

COMPLETE SYSTEM FOR

£1199

* 48K Apple II plus
* Disc Drive W/Controller
* Visicalc or Magic Window
* Video Monitor
* Plus 12 Months Warranty

DEANS Of Kensington

191 KENSINGTON HIGH STREET, LONDON W8.
Tel: 01-937 7896 Ext 6. Open to Sat (9.30am to 6.30pm)

● Circle No. 367

?RANDOM ERROR PROBLEMS?

?DIRTY MAINS?

The MF 10A MAINS INTERFERENCE FILTER

attenuates noise and high voltage transients.
The 10A capacity self contained unit with fuse, neon, and on/off switch offers a low cost solution to mains borne interference problems.

Price **£68** each (ex VAT)

Units up to 30A rating also available

*Data sheets available from

ALAN KIDDLE ASSOCIATES LIMITED

Fairlight House, 729 London Road, Hounslow, Middlesex TW3 1SE

Phone 01-543 0179
Telex 965649

● Circle No. 368

Advertisement Index

A
Abacus Micro Computers 122
Abacus Programs 240
Abraxus 202
ACE 224
ACT 74, 75, 187
A.D.E.S. (Little Genius) 27
Adler 78
A. J. Harding (Molimex) 233
Alan Kiddle 241
Almarc 189
Altek 186
Anadex 94
Anglia 182, 183
APTEC 63
Artic 230
Atlanta 27
Atlantic Computer Shop 88
Avery 242
Avon 228
B
BFI 38
Biodata 239
Blackbox/Rair 152
Blyth 137
Butel 42
C
Calco 232
Calisto 230
Cambridge Computer Store 218
Cambridge Micro Computers 198
Camden 212
Carradine 122
Casewell Mortimer 57
Chromasonic 221
Circle Business Systems 186
City Microsystems 238
Clenlo 102
Comart 195
Commodore Business 121
Commodore 192, 193
Compshop 237
Computech 231
Computer 100 214
Computer Applications Printing Service 180
Computerfacts 131
Computer Fair 12, 13
Computer Plus 194
Computer Store 223
Computer Supermarket 31
Comshare 70
Control Universal 30
Cosser 214
CPG/ISM 82, 83
Crofton 216, 240
Cronite 197
Crowther-Cosine 218
Crystal 239
CTEC 96
Cumana 26, 181
CWP 225
D
Datalect 25
Datarite 184
David Richards 20
Da Vinci 34
DDP 188
Deans 241
Digico 236
Digital Devices 203
Digitek 146
Digitus 40
Discom 34
Disking 177
DRG 39
Duplex Communications 7
E
East Fern 24
Electronic Brokers 114
Electronic Information 232
E.M.G. 58, 216, 236
Encotel 199
F
Fulcrum 206
G
Gate 115
Gower 145
GP Industrial 22
Graffcom 23
Grama (Winter) 18, 19
Guestel 72, 73
H
Hal 226
Henry's Radio 154
Hilderbay 197
Hitec 196
Hi Tech 52
Hotel Microsystems 60
I
Icarus 33, 217
ICE 211
ICS 226
Informex Centralex 200
Interam 130
IO Systems 234
Irvine 234
Ithaca Outside back cover
J
Johnson Micros 188
John Wiley 29, 209
JRS 204
K
KAI 92, 186
Kansas 202
Karadawn 106
Keytronics 224
KGB 48
Knights 222
Kontron 132
Kram 226
Kuma 153
L
Level 242
Lifeboat Assoc 207
Lintex 214
Lion 112
Little Genius 27
L & J Computers 208
London Computer Store 178
Lowe 139, 185
LP Enterprises 10, 11
LSI 118
Lucas Logic 215
M
Mannesmann Tally Ltd 81
Maplin 32
Marchessa 20
Mass Micros 27
MCC 193
Melbourne House 239
Metrotech 14, 15
Micro 8 Inside Back Cover
Micro 80 190
Microage 228
Micro Business Centre 201
Microcentre Inside Front Cover
Micro Computer Applications 200
Micromedia 210
Micropute 124, 140
Micros Mean Business 194
Microsolution 99
Microsource 236
Microstore 6
Microstyle 37
Microsystems 145
Microtechnology 198
Microtek 230
Microvalue Dealers 8, 9
Microware 212
Monolith 190
N
NCC 35
NEC 205
Network 242
Newbury 240
Northamber 87
NSC 21
P
Pearcom 59
Pearl International 16, 17
Pete & Pam 64
Photocoustics 210
Protocol 57, 218
Q
QA Data 222
R
Rair 229
Ram 210
Research Machines 28
Riva 5
S
SBD 194, 197, 232
SDM 208
Sharp 51, 110
Silica Shop 235
Sinclair Research 65, 66, 67, 68, 123
Sinta 57
Sintrom 222
Sirton 191
Soft Option 228
Spider Software 234
STCS 220
Stirling 204
Superior Systems 148
Supersoft 92
Swan 220
Swanley 184
Symblotics 30
Systems International 184
Systemsoft 224
T
3D Digital Design 36
Tabs 129
Technomatic 227
Telesystems 138
Tempus 204
Transdata 219
Transtec 138
Twickenham Computer Store 198
V
Verbatim 76
Videotex 24
Visconti (Essential Software) 150
Vision Business Systems 44
W
Watford 4
Wida 220
Windfall 38
Wordsworth 238
Y
Your Computer 216
Z
Zenith 213

Fighting your way through the silicon jungle?

We carry a comprehensive selection of microcomputer software, hardware and peripherals

Apple] [	Accounting
Apple ///	Stock Control
Sharp 3201, MZ80B	Database Management
Superbrain	Production Control
Altos	Graph Plotting
Millbank System 10	Word Processing

We are to you as Jane was to Tarzan!

Well, perhaps not quite, but please 'phone us for a brochure which explains exactly how we can help

THE AVERY
COMPUTER COMPANY
13, The Mall
Bar Hill
CAMBRIDGE
Tel. Crafts Hill 80991 (24 hours)

● Circle No. 369

SPECIAL CP/M AND MCNOS SYSTEMS

FROM £2500

SOFTWARE

Your special data handling problems, however demanding, can be rapidly met by our advanced techniques — at low cost. Our software can be easily modified to match the changing needs of your business.

HARDWARE

Our customised systems use the Shelton SIG/NET micro. SIG/NET's unique flexibility enables construction of hardware configurations to meet your current and future requirements exactly. There is unrestricted expansion from single to multi-user systems.

SERVICE

For maintenance and system-upgrade we offer a "loan-return" scheme — we lend you replacement equipment so that your computing continues while servicing is being done.

For full details contact:

NETWORK COMPUTER SYSTEMS LTD.
Telephone: Luton (0582) 508616

● Circle No. 370

IMPROVE YOUR PETTING TECHNIQUE!

NEW

with PROGRAMMING THE PET/CBM by RAY WEST

COMPREHENSIVE LIST OF CONTENTS

1 **INTRODUCTION AND OVERVIEW.** Plan of the book; sources of information; chronology of CBM hardware.
2 **BASIC AND HOW IT WORKS.** Syntax, internal storage and pointers, variables and running. Optimisation.
3 **PROGRAM AND SYSTEM DESIGN.** Concepts required for successful programs; overall design of systems.
4 **EFFECTIVE PROGRAMMING IN BASIC.** Seventeen problems in BASIC. Debugging.
5 **ALPHABETIC REFERENCE TO BASIC KEYWORDS.** Full description of all keywords includes non-CBM BASIC implementations.
6 **DISK DRIVES.** Comprehensive description of operation and workings of disks, with BASIC and machine-code demonstrations.
7 **ALPHABETIC REFERENCE TO DISK BASIC COMMANDS.** Comprehensive reference to BASIC 4's disk commands.
8 **OTHER PERIPHERALS AND HARDWARE.** Full description of CBM tape use; printers; EPROMs, other hardware.
9 **GRAPHICS AND SOUND.** Discussion with many examples of CBM graphics (including CRT chip); programming sound.
10 **THE TRANSITION TO MACHINE-CODE.** Introductory chapter to the 6502. Includes monitors, learners' programs.
11 **MORE 6502 MACHINE-CODE.** Fuller explanation of the 6502, with eighteen standard problems and their solutions. Debugging.
12 **ALPHABETIC REFERENCE TO 6502 OPCODES.** Notes with examples to illustrate each opcode.
13 **USING ROM ROUTINES.** Introduction to BASIC's principal routines; how to use them, modify them, relocate them.
14 **EFFECTIVE 6502 PROGRAMMING.** Assemblers, wedges, utilities, ordinary and relocating loaders, IEEE, PIAs, VIA.
15 **INDEX TO CBM BASIC ROMS AND RAM.** Memory maps of RAM and ROM, comparing and detailing all versions of BASIC.
16 **MATHEMATICAL PROGRAMMING.** Wide-ranging topics include precision, solving equations, finance, calculus, machine-code.
17 **BUSINESS AND EDUCATION.** Examples, applications and pitfalls in the fields of business and education.
APPENDICES: 6502 reference charts, hex-decimal interconversion, SUPERMON listings, pseudo-opcodes, ASCII tables, glossary.
INDEX

Many programs, diagrams and charts. Paperback, 19 x 26 x 2.5cm, 504 pages, ISBN 0 9507650 0 7.

LEVEL LIMITED, P.O. BOX 438, HAMPSTEAD, LONDON NW3 1BH.
U.K. price £14.90 (includes postage, packing). Please allow six days for delivery.

LEVEL LIMITED, P.O. BOX 438, HAMPSTEAD, LONDON NW3 1BH.
Please send me/us .....copy/ies of 'Programming the PET/CBM' by Ray West.

NAME: .....

ADRESS: .....

.....PC2

● Circle No. 371

Japanese micro computer products reflect the quality you need

EPSON

MX80 T
MX80 T-2 MX82
MX80 F/T MX82 F/T
MX80 F/T-2 MX100
Dot Matrix Printers
Main UK Distributors

BMC

BM12E - Green Screen
BM1401 RGB
Monitors
Sole UK Importers & Distributors

NEC

7700 & 3500 Series
Daisywheel Printers

TEC

Starwriter 40 - 40CPS
Starwriter 55 - 55CPS
Daisywheel Printers

FUJITSU

Micro 8
6809 Personal Computers
SP830 - 80CPS
Daisywheel Printers

OKI

Microline Range
Dot Matrix Printers

243

Micro Peripherals Ltd.

61 NEW MARKET SQUARE, BASINGSTOKE, HAMPSHIRE
Telephone: Basingstoke (0256) 56468 (4 lines) Telex: 858575
Japanese Office: 101 Abe Bldg, 4F, 2-42 Kanda Jinbocho, Chiyado-ku, Tokyo

IMPORTERS & DISTRIBUTORS OF QUALITY JAPANESE MICROCOMPUTER PRODUCTS

Circle No. 372

"MAKING MICROCOMPUTERS FOR THE '80s"

Pictured is the SuperFAST™ CACHE BIOS System. For further information and a catalogue of our IEEE S100 products contact us today

Coleridge Lane, Coleridge Road,
London N8 8ED England
Telephone: 01-341 2447
Telex: 299568

ITHACA InterSystems™ (UK) Ltd.

● Circle No. 373

244